The Guest River Total Maximum Daily Load Implementation Plan

January 24, 2005

The Lonesome Pine Soil and Water Conservation District's Guest River Group (GRG) developed this TMDL IP for the Commonwealth of Virginia. GRG's project manager and primary author of this report is Muiread Craft. This TMDL IP has been strengthened by contributions from numerous sources, many of which are cited in the acknowledgements below and in the reference section.

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List of Abbreviations

The following abbreviations are used throughout this document. To better aid the reader in comprehension of the document each abbreviation is defined here.

BMP – Best Management Practice
BST – Bacteria Source Tracking
DCR – Department of Conservation and Recreation
DEQ – Department of Environmental Quality
DMME – Department of Mines, Minerals and Energy
DNA – Deoxyribonucleic Acid
E. coli – Escherichia coli
EPA – United States Environmental Protection Agency
FC – Fecal Coliform
IP – Implementation Plan
IPSI – Integrated Pollutant Source Identification
LPSWCD – Lonesome Pine Soil and Water Conservation District
NRCS – Natural Resources Conservation Service
SMCRA – Surface Mining Control and Reclamation Act of 1977
TAC – Technical Advisory Committee (for this Implementation Plan)
TMDL – Total Maximum Daily Load (Study)
TVA – Tennessee Valley Authority
USACE – United States Army Corps of Engineers
USGS – United States Geological Survey
VAC – Virginia Administrative Code
VCE – Virginia Cooperative Extension
VDACS – Virginia Department of Agriculture and Consumer Services
VPDES – Virginia Pollutant Detection and Elimination System
VDH – Virginia Department of Health
VDOF – Virginia Department of Forestry
VDOT – Virginia Department of Transportation
WCHD – Wise County Health Department
WQMIRA – Water Quality Monitoring, Information and Restoration Act

1.0 Executive Summary

1.1 Introduction

This Implementation Plan (IP) addresses the Total Maximum Daily Load studies for the Guest River Watershed. The two studies included in this Implementation Plan (IP) are, "Guest River Total Maximum Daily Load Report TMDL Study for Aquatic Life Use Impairment" and "Bacteria TMDLs for Sepulcher Creek, Toms Creek and Crab Orchard Branch Wise County, Virginia", subsequently referred to as the TMDL studies. In 1998, the mainstem of the Guest River from its headwaters to confluence with Bad Branch was listed as impaired for violations of the general water quality standard. Also that year, Sepulcher Creek, Toms Creek (including Little Tom's Creek) and Crab Orchard Branch were listed for violation of the State's water quality standard for fecal coliform bacteria.

The Guest River watershed, designated VAS-P11R, comprises approximately 64,200 acres and 161.8 river miles. The entire length of Guest River and all of its tributaries are located within this watershed. Twenty-three percent of Wise County drains to Guest River. Fifty-two percent of the city of Norton drains to the Guest River watershed, whereas less than half a percent of Dickenson and Scott Counties drain to the watershed. Guest River is a tributary to Clinch River. The Guest River confluence with Clinch River is at river mile 244.1. Guest River is in the Tennessee River Basin, Hydrologic Unit Code 06010205. The communities of Flatwoods, Lipps, Tacoma, Banner, the Towns of Coeburn and Wise and part of the City of Norton are within the watershed.

The purpose of this IP is to identify the necessary corrective actions to achieve the reductions called for by these TMDL studies. The plan will set milestones for these actions in a ten-year time frame and outline funding strategies for implementation.

1.2 State and Federal Requirements

In the State of Virginia, there are state and federal requirements that guide development of TMDL Implementation Plans (IPs).

- Virginia Water Quality Monitoring, Information and Restoration Act of 1997 (*WQMIRA)*?
- §303(d) of the Federal Water Pollution Control Act of 1972 commonly known as the Clean Water Act (CWA)
- Requirements for Funding under §319 of the CWA

WQMIRA requires the State: to develop reports assessing water quality of state waters, to provide data to develop programs addressing water quality impairments, to develop TMDLs and to develop IPs. The CWA strives "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The inception of the federal TMDL program is found in section 303(d) of that legislation. Section 319 of the CWA provides for a federal grant program to target nonpoint source pollution.

1.3 Review of the TMDL Development

Virginia's Department of Environmental Quality (DEQ) and Tennessee Valley Authority (TVA) collected water quality data to establish the reduction allocations for each TMDL study. For the Aquatic Life Use TMDL, DEQ contracted TVA in 2001 to develop a sediment and nutrient loading estimate model for the Guest River Watershed. TVA developed the Integrated Pollutant Source Identification (IPSI) report. For the Bacteria TMDLs, DEQ used Bacteria Source Tracking (BST) methodology on 12 ambient water quality samples collected on a monthly basis from September 2002 through October 2003.

Summary of the Aquatic Life Use TMDL included:

- Repair all abandoned mine features
- Full cover on 100% of previously mined land
- 90% reduction of sediment delivery from tipples in Sepulcher Creek
- 100% overgrazed pasture improved to fair, 75% of fair pasture improved to good
- Reduce residential urban sources by 60%, all other urban sources by 50%disturbed areas by 70% and road bank erosion by 50%
- Repair ½ of eroding stream banks
- Reduce clearcut area load by 25% and improve shrub/scrub areas to 100%

The following table summarizes the reductions for the Bacteria TMDL:

- 71% reduction of bacteria loading to Sepulcher Creek
- 84% reduction of bacteria loading to Toms Creek
- 94% reduction of bacteria loading to Crab Orchard Branch

The TMDL studies are available on the DEQ website at http://www.deq.state.va.us/tmdl. Also available on the website are the comments from the public and the EPA rationale for approval of the TMDL studies.

1.4 Public Participation

The first Implementation Plan public meeting coincided with the final public meeting for the Bacteria TMDL Study. This meeting was held January 26, 2004. Thirty-eight people attended. Meeting attendees were encouraged to sign up for focus groups to provide input to the IP. On March 4th, 2004, the Bacteria focal group met to discuss the sources and ranked the human contribution as the most important source to address, followed by pets and then livestock. On March 9th, 2004, the Urban NPS focal group met and ranked the urban sources. The participants ranked the sources with disturbed areas being most important followed by streambank erosion and general urban sources and finally road bank erosion. On March 11th, 2004, the agriculture and forest land focal group met to discuss their confidence in the TMDL report and how they feel the implementation plan should be approached. On March 25th, 2004 a session was held for those with interests in the resource extraction section of the IP. There were no attendees.

The Guest River Group website is a resource for the public to learn about the issues facing the watershed, including those in the TMDL studies, http://www.guestriverproject.org.

1.5 Implementation Actions

The Technical Advisory Committees (TACs) assessed the implementation actions required to achieve the necessary reductions called for by the TMDL studies. The TACs worked on sources from agricultural, urban, resource extraction and forestry land uses.

The implementation actions determined for agricultural land uses focused on both sediment and bacteria reductions. Voluntary installation of best management practices (BMPs) through existing agricultural cost share programs will be the main goal to reduce these sources of pollutants.

Control measures include the exclusion of livestock from the Guest River and its tributaries, installation of forest riparian buffers, and the installation of alternative watering systems. To improve cover on pastureland, the placement of the alternative watering facilities becomes a critical component to promote better grazing distribution. In addition to grazing distribution, the addition of division fencing would allow livestock producers to move toward management intensive grazing. Through conservation planning, by Natural Resource Conservation Service personnel, any eroding streambanks will be stabilized as part of the plan with the other BMPs.

The urban TAC addressed sediment and bacteria loadings in the watershed. The goal for the bacteria is to remove 100% of the straight pipes in the affected subwatersheds. Either on-site septic systems or extension of sewer lines from a public sewage treatment plant may be corrective actions. The main effort will focus on sites where a traditional gravity flow drainfield and septic tank can be installed. Only after these sites have been repaired, will the group consider the installation of alternative treatment units (ATUs). Installation of ATUs will be site specific and determined by Wise County Health Department. Wastewater treatment systems discharging to streams will require permits from the Department of Environmental Quality. This approach allows for two benefits. First, minimizing the amount of ATUs in the watershed because poorly maintained ATUs can load as many bacteria in to the stream as a regular straight pipe and can cost up to three times as much as a conventional septic system. Secondly, the LENOWISCO Planning District Commission, is planning a sewer study on corrective actions for Southwest Virginia "Hard to Serve" communities. The Preliminary Engineering Report will be incorporated into the implementation plan as soon as completed. The study will be completed by January of 2006.

1.6 Measurable Goals and Milestones

The goal of the TMDL studies developed for the Guest River is to bring the impaired water segments into compliance with the applicable water quality criteria. Once the segments achieve compliance, then the segment can be removed from the 303(d) Impaired Waters List.

Throughout the ten year project timeframe, completed implementation actions can be entered into the IPSI model to track reductions. Water quality monitoring will be scheduled by the Department of Environmental Quality in their annual monitoring plans to assess the water quality status throughout implementation. During the fifth year, project progress will be assessed by DEQ. If the water quality has not improved, the full TMDL scenario will be pursued, and progress will be assessed again in the tenth year.

The goal of the IP milestones is to measure progress over the implementation process. For the Urban implementation actions, work will begin by conducting inventories of impervious surfaces and critically eroding stream reaches associated with stormwater problems and suspect straight pipe sites. Once inventories are complete, stormwater retrofits and conventional septic systems can be installed. Education and outreach about stormwater runoff will be a crucial component to complement these actions. Local governments will review their ordinances associated with erosion and stormwater control.

For the agriculture implementation actions, identification of the owners or operators for the livestock production sites listed in the IPSI is the first step. Each site needs to have a conservation plan in place. These plans will hold the items required for the reduction, such as livestock exclusion, streambank stabilization, pasture and hayland planting and other agricultural best management practices (BMPs). Cost share monies will be offered based on size and location of the site. For example, sites that require livestock exclusion in Sepulcher Creek, Toms Creek and Crab Orchard Branch would receive priority to aid in achieving the bacteria reductions called for in those streams.

For the resource extraction implementation actions, it is important to cross reference the IPSI identified previously mined land with existing mining permits and existing coal seams. This will enable the identification of remining opportunities within watershed. Abandoned mine lands identified in watershed unable to utilize remining, will be reclaimed with grant monies. Voluntary installation of BMPs will be coordinated at tipples identified in Sepulcher Creek.

For forestry implementation actions, BMP workshops for loggers will continue as it has for the past three years. The outreach campaign for landowners will begin pending approval of funding proposals outlined in Chapter 10. The development of a citizen watchdog group to monitor new logging jobs without proper VDOF notification will aid the effort of 100% notification.

Since 1996, the Guest River Restoration Project has completed mine land reclamation, septic system installation, streambank stabilization, agricultural best management practices and education activities. The group will use the IP as a strategic plan to continue their efforts. The completion of the regional sewer study by the PDC will bring solutions for the wastewater disposal issues the Guest River watershed faces. The study will also include plans for implementation of suggested measures, to include plans for funding of projects.

1.7 Stakeholders' Roles and Responsibilities

Stakeholders are individuals who live or have land management responsibilities in the watershed, including government agencies, businesses, private individuals and special interest groups. Stakeholder involvement and cooperation is essential for achieving the goals of these TMDLs (*i.e.* improving water quality and removing the Guest River from the impaired waters list). The United States Environmental Protection Agency (USEPA) has the responsibility of overseeing the various programs necessary for the success of the Clean Water Act. Administration and enforcement of such programs normally falls largely to the states. In the Commonwealth of Virginia, water quality problems are addressed thru legislation, incentive programs, education, and legal actions. Currently, there are a number of state agencies responsible for regulating and/or overseeing activities that impact water quality in Virginia. These agencies include: Virginia Department of Environmental Quality (VDEQ), Virginia Department of Conservation and Recreation (VDCR), Virginia Department of Agriculture and Consumer Services (VDACS), Virginia Department of Health (VDH), the Virginia Department of Forestry (VDOF), Virginia Corporative Extension (VCE), and Virginia Department of Mines, Minerals and Energy (VDMME). The primary agencies applicable to the Guest River watershed are VDEQ, VDCR, VDH, VDOF, VCE and VDMME. Local government comprises of four entities. The Guest River watershed blankets portions of four localities: the County of Wise, the City of Norton and the towns of Coeburn and Wise. Each jurisdictional government is divided into several departments and divisions. Each entity provides various service operations or resources that will be instrumental to the success of this IP.

1.8 Integration with other Watershed Plans

As part of the implementation plan development process, adoption by local governments is necessary since the localities in the watershed do not currently have watershed plans. However, it is the intention that this plan be integrated with other planning processes in the area. For example, the Lenowisco Planning District Commission currently plans to complete a sewer study for "hard to serve" communities. This IP is intended to uphold the finding of that study once it is complete, in order to reduce counter productive actions.

1.9 Potential Funding Sources

In general, funding for the actions contained in this Implementation Plan (IP) could potentially come from general sources:

· Locality funds
· Private / nonprofit funds
· Virginia State funds
· Federal funds

When shaping the approach for this IP consensus within the Technical Advisory Committee (TAC) centered on leveraging existing programs and resources to tackle implementation of this TMDL. To that end, the approach developed by this IP is one that aims to build synergies with other programs in the watershed. The State of Virginia has a vested interest in the success of this plan. The Virginia Department of Environmental Quality (DEQ) underwrote the cost of developing the Guest River TMDLs and this IP.

USEPA develops guidelines that describe the process and criteria to be used to award Clean Water Act Section 319 NPS grants to states. States may use up to 20% of the Section 319 incremental funds to develop NPS TMDLs as well as to develop watershed-based plans for Section 303(d) listed waters. The balance of funding can be used for implementing watershed-based plans for waters that have completed TMDLs. Implementation of both agricultural and residential BMPs is eligible. None of the four watershed jurisdictions currently has a stormwater utility for funding stormwater infrastructure projects and thus those projects are funded thru the municipality's general fund. Several nonprofit organizations will participate in the actions committed to in this IP. Much of those labors will be met through staff and volunteer time. Those efforts include outreach efforts like classroom presentations, buffer restoration, educational material development and distribution, etc. Funding for the activities pursued by the nonprofits can come from their members, a supporting foundation, or grants.

2.0 Introduction

2.1 Purpose, Scope and Timeframe

This Implementation Plan (IP) is to be associated with the reports, "Guest River Total Maximum Daily Load Report TMDL Study for Aquatic Life Use Impairment" and "Bacteria TMDLs for Sepulcher Creek, Toms Creek and Crab Orchard Branch Wise County, Virginia" which will be referred to as the TMDL Studies. The TMDL Studies set allocations to limit sediment loads for the main body of the Guest River and limit bacteria pollutant loads for its tributaries. This IP aims to bridge the gap between those specified pollutant load allocations and actual reductions in sediment and bacteria loading to the Guest River Watershed. The foundation of this IP is a set of actions found in Chapter 6 focused on reducing the levels of fecal coliform and E. coli *(Escherichia coli)* bacteria in Sepulcher Creek, Tom's Creek and Crab Orchard Branch from human, pet and livestock sources, and levels of sediment reaching the main stem of the Guest River, with the final goal of complying with the State of Virginia water quality criteria. This IP follows the State guidance for TMDL implementation plans published by the Virginia Department of Conservation and Recreation (DCR) and the Department of Environmental Quality (DEQ).

The primary Guest River TMDL study, approved by the US Environmental Protection Agency (USEPA) in November 2003, examined the Guest River watershed, its characteristics, and the sources of sediment watershed-wide. Through a detailed Integrated Pollution Source Identification (IPSI) study, allocations, or maximum allowable loads, from each of the sources of sediment in the watershed were established to bring Guest River into compliance with the aquatic life use water quality standard. The following modeling scenario from the TMDL Study (Table 2.1) presents a set of sediment reductions needed to reduce the sediment loading to Guest River sufficiently to bring the river into compliance with the water quality standard for aquatic life use.

Table 2.1 TMDL Reductions in Loadings from Existing Conditions

Land Use Category	Existing TSS load (tons/year)	% Reduction	Stage 1 TSS load (tons/year)
Urban Land	4,666.6	10%	4,200.6
Cropland	7.3	0%	7.3
Pastureland	1,641.9	26%	1,219.4
Forest Land	4,535.7	0%	4,535.7
Active Strip Mine	17.8	0%	17.8
Tipples	1,323.1	74%	341.7
Previously Mined Land	5,181.8	38%	3,208.1
Abandoned Mine Features	1,943.8	100%	0.0
Disturbed Areas	781.8	25%	586.3
Stream Banks	331.1	18%	270.8
Livestock Access Areas	8.3	0%	8.3
Unimproved Roads	802.2	11%	714.1
Total NPS Load	**21,241.4**	**29%**	**15,110.1**

The bacteria TMDL study for the tributaries of the Guest River (Sepulcher Creek, Toms Creek and Crab Orchard Branch), approved by the US Environmental Protection Agency (USEPA) in May 2004, used a load duration approach to establish the total maximum daily loads within the three sub-watersheds. Fecal Coliform and E. coli bacteria are excreted through the feces of warm-blooded animals. Their presence suggests a risk of higher levels of human illness upon contact with the water. Bacteria allocations were based on Bacteria Source Tracking (BST) data collected in each watershed. Analysis of BST data allowed a percentage of bacteria to be attributed to each of four sources; human, livestock, pet and wildlife. Reductions from each of the sources of bacteria in the watershed were established to bring the three tributaries into compliance with the E.coli bacteria water quality criteria. The following table, Table 2.2, from the TMDL Study presents a set of bacteria reductions needed to reduce the bacteria loading to the three creeks sufficiently to bring them into compliance with the water quality criteria for E.coli bacteria.

Table 2.2 Average Annual load distribution, reduction, and allowable load by source for each impaired watershed

Sepulcher Creek Watershed					
	Total (cfu/yr.)	**Human @ 15% (cfu/yr.)**	**Pet @ 24% (cfu/yr.)**	**Livestock @ 31% (cfu/yr.)**	**Wildlife @ 30% (cfu/yr.)**
Average Annual Load	**1.11×10^{13}**	**1.64×10^{12}**	**2.70×10^{12}**	**3.45×10^{12}**	**3.30×10^{12}**
Reduction	**71%**	**71%**	**71%**	**71%**	**71%**
Allowable Annual Load	**3.19×10^{12}**	**0.48×10^{12}**	**0.78×10^{12}**	**1.00×10^{12}**	**0.96×10^{12}**
Toms Creek Watershed					
	Total (cfu/yr.)	**Human @ 17% (cfu/yr.)**	**Pet @ 17% (cfu/yr.)**	**Livestock @ 37% (cfu/yr.)**	**Wildlife @ 30% (cfu/yr.)**
Average Annual Load	**1.64×10^{14}**	**2.79×10^{13}**	**3.72×10^{13}**	**6.01×10^{13}**	**4.88×10^{13}**
Reduction	**84%**	**84%**	**84%**	**84%**	**84%**
Allowable Annual Load	**2.62×10^{13}**	**4.46×10^{12}**	**4.35×10^{12}**	**9.62×10^{12}**	**7.81×10^{12}**
Crab Orchard Branch					
	Total (cfu/yr.)	**Human @ 27% (cfu/yr.)**	**Pet @ 21% (cfu/yr.)**	**Livestock @ 18% (cfu/yr.)**	**Wildlife @ 34% (cfu/yr.)**
Average Annual Load	**1.74×10^{14}**	**4.70×10^{13}**	**3.65×10^{13}**	**3.13×10^{13}**	**5.92×10^{13}**
Reduction	**94%**	**94%**	**94%**	**94%**	**94%**
Allowable Annual Load	**9.98×10^{12}**	**0.28×10^{13}**	**0.22×10^{13}**	**0.19×10^{13}**	**0.36×10^{13}**

To achieve compliance with the water quality standard, this IP forms a partial strategy around the reductions stated in the TMDL studies by focusing on actions that will reduce sediment and bacteria sources. The corrective actions included in this IP are those committed to by various stakeholders in the watershed and will be implemented within a ten-year timeframe. The IP encompasses the efforts and collaboration of multiple agencies: Wise County and the City of Norton, several state agencies including: the Virginia Departments of Environmental Quality (DEQ) and Conservation and Recreation (DCR) and Transportation (VDOT), several non-profit organizations and individual stakeholders in the watershed.

A ten-year timeframe was chosen for this project with a midway and an end period of assessment. For communication purposes the following convention is employed: the ten year timeframe is divided into 10 one-year increments, implementation years (IYs) where IY-1 is the first year subsequent to finalizing the IP, IY-5 is the fifth year, etc. Some of the actions prescribed by this plan are discrete actions, e.g., mapping urban sites for stormwater retrofits that will occur during a single or multiple IYs. Other actions are ongoing activities, e.g., outreach for business owners on stormwater runoff. These ongoing actions will occur for the duration of the project. All actions are affixed with a time constraint outlining the years where activity regarding that action will occur, e.g. Mapping IY-1, Outreach IY-1 thru IY-10.

2.2 Regulatory Background

The Federal Water Pollution Control Act, known as the Clean Water Act (CWA), was enacted in 1972. The purpose of this legislation was *"to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."* Part of the CWA requirements include that states develop and publicize water quality standards for waters. The CWA requires states to identify water bodies not meeting the published water quality standards for pollutants in section 303(d) of the Act. This list is often called the "303(d) list" or the "impaired waters list." In 1994, Virginia published their first impaired waters list. Section 303(d) also requires that, if a particular water body is listed as "impaired," the state must develop a "total maximum daily load" for the exceeded standard for the water body. The "total maximum daily load" or TMDL is essentially a "water pollution budget." During a TMDL study, the state determines for a specific water body the pollutant loading allowed from all sources in the watershed that will be low enough to keep the water body in compliance with the water quality standard. Once a TMDL is completed for a waterbody then the watershed stakeholders must carry out a strategy that that will limit the pollutant loadings to those levels allocated in the TMDL study. Implementation Plans are not a requirement of the CWA. The 1997 Virginia Water Quality Monitoring, Information, and Restoration Act (WQMIRA) listed Implementation Plans as a requirement in the TMDL process.

2.3 Guest River TMDL Efforts

DEQ listed the Guest River on the Commonwealth's 1996 303(d) TMDL list for violations of the general standard for an impaired benthic community. Subsequently, the Guest River and tributaries Sepulcher Creek, Yellow Creek, Bear Creek, Toms Creek,

Little Toms Creek and Crab Orchard Branch were listed as impaired on Virginia's 1998 303(d) TMDL list for exceeding the water quality criterion for fecal coliform bacteria. In 2002, the Guest River main stem, Yellow Creek and Bear Creek were delisted for bacteria violations. Sepulcher Creek, Toms Creek, Little Toms Creek and Crab Orchard Branch continued to show bacteria violations and were included on the 2002 303(d). A TMDL study and report, "Guest River Total Maximum Daily Load Report TMDL Study for Aquatic Life Use Impairment" was prepared by DEQ and was approved by EPA on November 13, 2003. "Bacteria TMDLs for Sepulcher Creek, Toms Creek and Crab Orchard Branch Wise County, Virginia", a TMDL study and report, was prepared by DEQ and approved by EPA on May 4, 2004. The TMDL study includes Little Toms Creek as a tributary of Toms Creek, and is included in the term Toms Creek Watershed. Development of the IP began in January of 2004 by the Lonesome Pine Soil and Water Conservation District's Guest River Group (GRG). Throughout the process, the GRG has worked closely with DCR and DEQ personnel. The Technical Advisory Committee is comprised of the GRG membership, including agency personnel from NRCS, USFS, TVA, DMME, VDOF, VDOT, WCHD, and VT-PRP. Steering Committees were put together from the TAC to address the different sources of pollutants, namely urban, resource extraction, agriculture and forestry.

2.4 Guest River Watershed

The Guest River Watershed is located in Wise County (Figure 2.1) in Southwest Virginia. According to Tennessee Valley Authority's report titled "Guest River Watershed Nonpoint Source Pollution Inventory and Pollutant Load Estimates" the description of the watershed is as follows:

The Guest River is a tributary of the Clinch River in southwestern Virginia (Hydrologic Unit Code 06010205-P11). The confluence of the two streams is at Clinch River Mile 244.2. The Guest River Watershed covers 64,244 acres almost entirely in Wise County, with minor areas in Scott and Dickenson counties (Figure 2.2). The Guest River watershed is in the Appalachian Plateaus physiographic province. This area consists of flat-lying or gently dipping strata of Pennsylvanian-age sandstone, shale, and coal. This region has been dissected by geologic erosion into an area of high relief and dendritic stream drainage patterns with uniformly steep-sided valleys. Average elevation of the Appalachian Plateaus in Virginia is between 2000 and 2500 feet. The Appalachian Plateaus are the source of coal, Virginia's most valuable mineral resource. Virginia's coal production has averaged over one billion dollars annually for the last twenty years. (DMME)
About two thirds of the watershed is forested. Mine land, including active mines and formerly mined land, occupies significant land area. The watershed includes the communities of Norton, Wise, and Coeburn. There is little agriculture; most of this is pasture.

Figure 2.1 Wise County (Guest River Watershed)

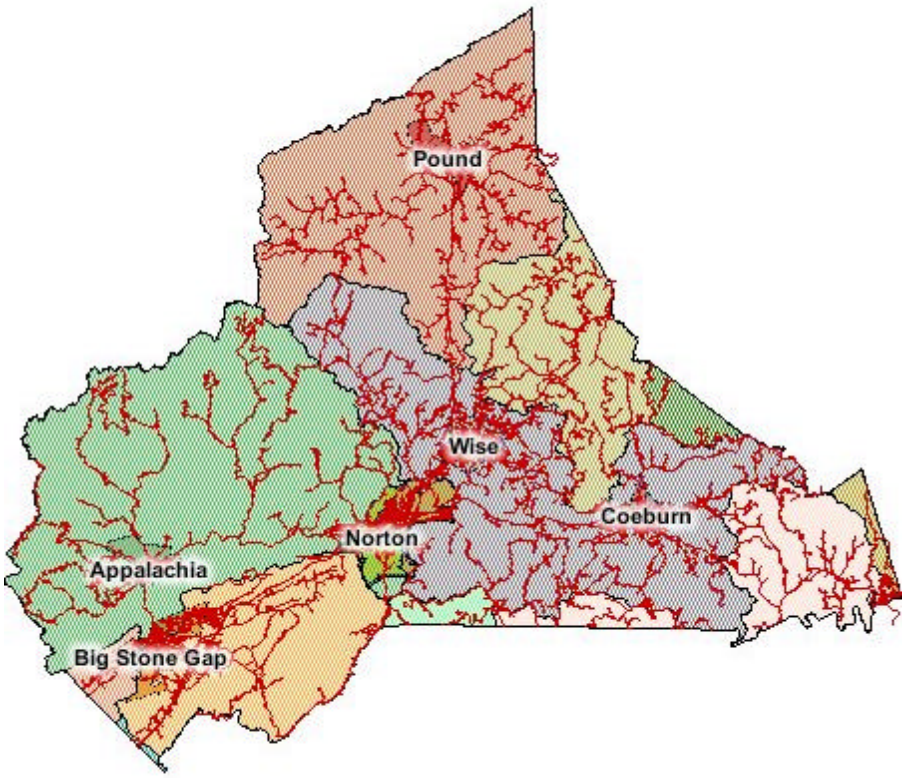
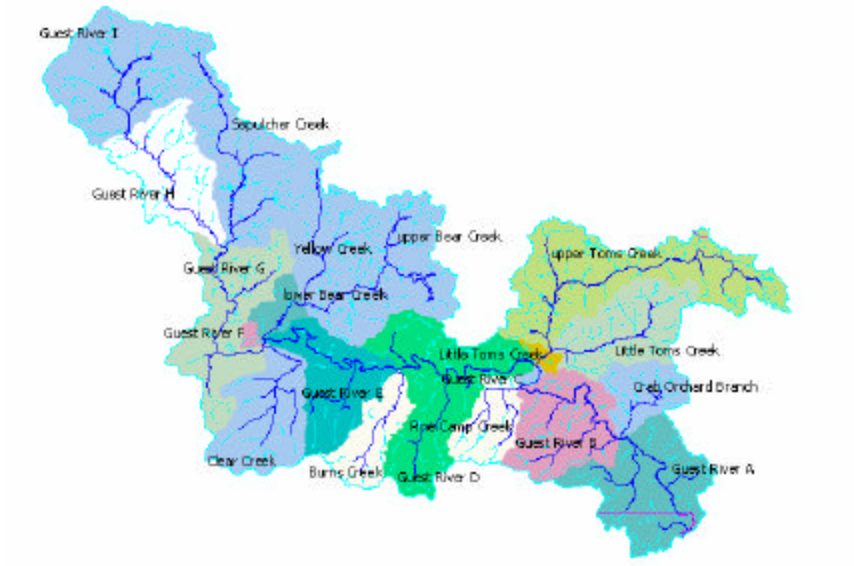


Figure 2.2 Guest River Watershed



2.5 Designated Use and Water Quality Standard

The Sepulcher Creek, Toms Creek and Crab Orchard Branch Bacteria TMDLs describe the designated use and water quality standard. According to Virginia Water Quality Standards (9 VAC 25-260-5), the term *"water quality standards means provisions of state or federal law which consist of a designated use or uses for the waters of the Commonwealth and water quality criteria for such waters based upon such uses. Water quality standards are to protect the public health or welfare, enhance the quality of water and serve the purposes of the State Water Control Law (§62.1-44.2 et seq. of the Code of Virginia) and the federal Clean Water Act (33USC §1251 et seq.)."*

As stated above, Virginia water quality standards consist of a designated use or uses and water quality criteria. These two parts of the applicable water quality standard are presented in the sections that follow.

According to Virginia Water Quality Standards (9 VAC 25-260-10A), *"all state waters are designated for the following uses: recreational uses (e.g., swimming and boating); the propagation and growth of a balanced indigenous population of aquatic life, including game fish, which might be reasonably expected to inhabit them; wildlife; and the production of edible and marketable natural resources (e.g., fish and shellfish)."*

As stated above, Sepulcher Creek, Toms Creek and Crab Orchard Branch must support all designated uses and meet all applicable criteria.

The applicable water quality criteria for bacteria in the Sepulcher Creek, Toms Creek and Crab Orchard Branch watershed have changed since the initial listing on the 303(d) report. Following EPA recommendations, the Virginia Department of Environmental Quality (DEQ) proposed more stringent fecal coliform bacteria standards as well as new standards for *Escherichia coli* (*E. coli*) bacteria. These new standards were adopted by the State Water Control Board in May 2002, public noticed in June 2002, approved by the USEPA in November 2002, and were effective January 15, 2003.

The EPA recommendation that states adopt *E. coli* and enterococci (saltwater) standards stems from a stronger correlation between the concentration of *E. coli* and enterococci organisms and the incidence of gastrointestinal illness. *E. coli* and enterococci are both bacteriological organisms that can be found in the intestinal tract of warm-blooded animals. *E. coli* is a subset of fecal coliform group; thus, a waterbody listed as impaired for fecal coliform is considered to be listed for *E. coli* as well.

Although Sepulcher Creek, Toms Creek and Crab Orchard Branch were listed as impaired due to a violation of the previous fecal coliform standard, the TMDL must be developed to meet the new *E. coli* bacteria standard. The interim fecal coliform bacteria standard presented below will not apply to this TMDL since 12 *E. coli* bacteria samples were collected as part of the bacteria source tracking study for the source assessment.

New Bacteria Standards

For a non-shellfish supporting water body such as Sepulcher Creek, Toms Creek and Crab Orchard Branch to be in compliance with Virginia bacteria standards for primary contact recreational use, the DEQ specifies the following criteria (9 VAC 25-260-170): *apply for a sampling station after the bacterial indicators described in subdivision 2 of this subsection have a minimum of 12 data points or after June 30, 2008, whichever comes first. 2. E. coli and enterococci bacteria per 100 ml of water shall not exceed the following:*

Parameter	Geometric Mean[1] (cfu/100 ml)	Single Sample (cfu/100 ml)
E.coli (fresh water)	126	235
Enterococci (saltwater & Transition Zone 3)	35	104

[1] for two or more samples taken during a calendar month.

If the waterbody exceeds the criterion as listed above more than 10 percent of the time, the waterbody is classified as impaired and a TMDL must be developed and implemented to bring the waterbody into compliance with the water quality criterion. Based on the sampling frequency, only one criterion is applied to a particular datum or data set (9 VAC 25-260-170). If the sampling frequency is one sample or less per calendar month, the instantaneous criterion is applied; for a higher sampling frequency, the geometric mean criterion is applied. For Sepulcher Creek, Toms Creek and Crab Orchard Branch, the TMDL is required to meet the instantaneous criterion since the load-duration approach used to develop the TMDL for Sepulcher Creek, Toms Creek and Crab Orchard Branch yields the maximum allowable bacteria concentration under any given flow condition. Unlike a continuous time series simulation, the flow duration approach does not yield daily bacteria concentrations that are needed to apply the geometric mean standard. Such an approach ensures that TMDLs, when implemented, do not result in violations under a wide variety of scenarios that affect bacteria loading. The Virginia Water Quality Standards (9 VAC 25-260-5) define "water quality standards" as *provisions of state or federal law which consist of a designated use or uses for the waters of the Commonwealth and water quality criteria for such waters based upon such uses. Water quality standards are to protect the public health or welfare, enhance the quality of water and serve the purposes of the State Water Control Law (62.1-44.2 et seq. of the Code of Virginia) and the federal Clean Water Act (33 USC 1251 et seq.).*
In the Virginia Water Quality Standards (9 VAC 25-260-10 A) *All state waters are designated for the following uses: recreational uses e.g., swimming and boating; the propagation and growth of a balanced indigenous population of aquatic life including game fish, which might reasonably be expected to inhabit them; wildlife; and the production of edible and marketable natural resources, e.g., fish and shellfish.*
Further the general criteria, which is the basis of the aquatic life use impairment on Guest River, is defined in the Virginia Water Quality Standards (9 VAC 25-260-20 A). *All state waters, including wetlands, shall be free from substances attributable to sewage, industrial waste, or other waste in concentrations, amounts, or combinations which contravene established standards or interfere directly or indirectly with designated uses of such water or which are inimical or harmful to human, animal, plant, or aquatic life. Specific substances to be controlled include, but are not limited to: floating debris, oil, scum, and other floating materials; toxic substances (including those which bioaccumulate); substances that produce color, tastes, turbidity, odors, or settle to form sludge deposits; and substances which nourish undesirable or nuisance aquatic plant life.*

3.0 State and Federal Requirements for IP

3.1 Background

In the State of Virginia, three sets of regulations govern the development of TMDL Implementation Plans (IPs); The Virginia Water Quality Monitoring, Information and Restoration Act of 1997 (WQ MIRA), §303(d) of the Federal Water Pollution Control Act of 1972 commonly known as the Clean Water Act (CWA) and Requirements for Funding under §319 of the CWA.

3.2 State Requirements

Virginia's 1997 Water Quality Monitoring, Information and Restoration Act (WQMIRA) (§62.1-44.19:4 through 19:8 of the Code of Virginia) requires the development of a TMDL IP. Virginia's Department of Environmental Quality (DEQ) must "develop and implement a plan to achieve fully supporting status for impaired waters." An IP must include the date of expected achievement of water quality objectives, measurable goals, necessary corrective actions and associated costs, benefits and environmental impact of addressing the impairment, in order to be approved by the State Water Control Board.

3.3 Federal Recommendations

USEPA and Section 303(d) of the CWA do not require the development of an implementation plan. USEPA delineates the minimum elements of an approvable IP in its 1999 "Guidance for Water Quality-Based Decisions: The TMDL Process." The recommendations follow closely with the WQMIRA requirements. USEPA recommends a description of the implementation actions and management measures, a time line for implementing these measures, legal or regulatory controls, the time required to attain water quality standards, and a monitoring plan and milestones for attaining water quality standards.

3.4 Federal Consent Decree

The Guest River TMDL studies were listed on the 1998 Impaired Waters List. The Commonwealth of Virginia has agreed to develop TMDL studies for all the impaired segments listed on the 1998 303(d) Impaired Waters List by the year 2010. This is noted by the Commonwealth's participation in the June 11, 1999 consent decree settling federal case no. 98-979-A "American Canoe Association, Inc. and the American Littoral Society v. USEPA and USEPA – Region III".

3.5 Requirements for Section 319 Fund Eligibility

The IP must contain additional requirements, before implementation actions can be funded. The CWA was amended in 1987 to establish the Nonpoint Source Management

Program in §319 of that act. 319 funds are available to States, Territories, and Native American Tribes for activities including the restoration of impaired stream segments. The implementation actions listed in this document will require substantial amounts of money to execute. Therefore, at the suggestion of the Virginia Department of Conservation and Recreation, the requirements for §319 fund eligibility are also discussed within this chapter.

The "Supplemental Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories in FY 2003" identifies the following nine elements that must be included in the IP to meet the 319 requirements:

1 Identify the causes and sources of groups of similar sources that will need to be controlled to achieve the load reductions estimated in the watershed-based plan
2 Estimate the load reductions expected to achieve water quality standards
3 Describe the NPS management measures that will need to be implemented to achieve the identified load reductions
4 Estimate the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement the watershed-based plan
5 Provide an information/education component that will be used to enhance public understanding of the project and encourage the public's participation in selecting, designing, and implementing NPS management measures
6 Provide a schedule for implementing the NPS management measures identified in the watershed-based plan
7 Describe interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented
8 Identify a set of criteria for determining if loading reductions are being achieved and progress is being made towards attaining water quality standards, and if not, the criteria for determining if the watershed-based plan needs to be revised
9 Establish a monitoring component to evaluate the effectiveness of the implementation efforts

4.0 Review of Guest River TMDL

4.1 Description of Impairment

The Guest River is in violation of the general water quality criteria for aquatic life use impairment. This impairment was identified through benthic macroinvertebrate surveys. The impaired benthic community was attributed to sedimentation in the Guest River watershed. Benthic macroinvertebrates are bottom dwelling organisms that are large enough to see with the naked eye. They consist of insects, mollusks, crustaceans and annelid worms. Benthic macroinvertebrates are used to monitor water quality changes since they are a fixed testimony to the conditions of the surrounding area. Their variable tolerance to pollutants helps monitors to derive stream conditions based on the diversity found in the community.

Sediment in the Guest River Watershed is attributed to historical resource extraction, agricultural production, urban run-off and stream bank erosion. Excess sediment in the stream can clog up habitat for benthic macroinvertebrates. It was concluded by DEQ biologists that the benthic impairment was attributed to loss of habitat due to excess sediment in the stream.

Sepulcher Creek, Toms Creek and Crab Orchard Branch have been listed for fecal coliform impairments. Multiple samples were collected over the period of a month and this data along with instantaneous criteria were used to determine violations of the water quality standard. The data compiled from the study are summarized in table 4.1.

Table 4.1 Fecal coliform data compiled by TVA on Sepulcher creek, Toms Creek, Little Toms Creek and Crab Orchard Branch

Station	Date of First Sample	Date of Last Sample	Number of Samples	Average	Minimum	Maximum	Number of Exceed-ances*	Max. Geom. Mean*
6BSEP00TVA	3/9/1999	6/24/2002	25	672	10	2220	9	364
6BSEP000.10	6/12/1996	6/24/2002	75	138	5	1520	1	457
6BTMS000.60	6/12/1996	6/24/2002	46	1147	5	4980	13	2970
6BLTF000.10	6/26/1996	6/24/2002	45	625	5	5200	7	1950
6BCRA000.40	6/12/1996	6/24/2002	49	704	5	5000	6	985

- Exceedances of the fecal coliform instantaneous standard of 1,000 cfu/100 ml, and the Geometric Mean standard of 200 cfu/100 ml

4.2 Watershed Characteristics

The Guest River watershed is a rural stream contained almost entirely in Wise County and part of the City of Norton. The watershed lies within the Central Appalachian ecoregion, which is characterized by a high, dissected, rugged plateau composed of sandstone, shale, conglomerate, and coal. The average elevation is between 2000 and 2500 feet. The majority of the watershed is mesophytic forest with areas of northern hardwood forest, because of the cool climate and rugged terrain. The geology of the area consists of sandstone, shale, clay and coal. Coal mining is a major industry in the area

because bituminous coal mines are common. As a result of this extraction, acid mine drainage and stream siltation associated with coal mining is prevalent.

The Guest River watershed is in the Appalachian Plateau physiographic province. Most of the tributaries of the Guest River are steep sided valley drainages. The streams have a steep gradient ranging from 10 percent slopes to 40 percent slopes in most areas. Areas which have been strip mined have slopes up to 55 percent.

Soils within the watershed are sandy loam or clay due to the sandstone composition of the bedrock layers. The Norton and Wise formations and Gladesville sandstone make up the geologic components of the region. These formations are in the Pennsylvanian Series of the Carboniferous system according to *U.S.G.S. Survey Bulletin No. XXIV*. Some of the sandstones and conglomerates are so resistant to weathering that they result in plateaus and outcrops of stone. These features are apparent in the Guest River Gorge towards the mouth of Guest River. Where slopes are very steep, removing trees and forest cover causes soils to erode quickly so that pasture or cultivation is not possible.

The geologic structure of the basin varies from horizontal formations to angled formations. That is, rather than a uniform horizontal thickness to each layer of either sandstone, clay, coal and shale, these fold and the thickness of each varies. Given the properties of each rock layer, their deformities vary. The harder stone will buckle whereas the softer stones may thin. Due to these deformities in the geologic formations, the location of the coal layers varies from the land surface to deep underground. Coal availability and extraction occurs in the upper Guest River watershed and along the Rocky Fork, Sepulcher Creek, Yellow Creek and Bear Creek sub-watersheds. Mines exist on Toms Creek and Little Toms Creek as well. In the first half of the twentieth century, Wise County produced coke from the coal, limestone and lumber resources in this drainage. As noted earlier, lumber removed from steep slopes causes the soil mantle to quickly wash away. This becomes an issue when the land use is changed for a forested area. Many times when a clearcut is contracted, the landowner intends to change the use of his property for other purposes, which leaves the steep slopes unprotected by the forests. Table 4.2 demonstrates the land uses recorded at the time of the TMDL study.

Table 4.2 Individual and aggregated land use categories based on TVA's IPSI model

IPSI Land Use Category	TMDL Land Use Category	Area (acres) [2]
Residential	Urban Land	6,139.6
Commercial		1,256.5
Developed Open		201.4
Industrial		347.2
Transportation		4.5
Airport		157.1
Railroad Yards		50.1
Major Hwy		442.5
Powerline		319.7
Natural Gas Wells		84.4
Railroad Line		N/A
Low Residue Row Crop	Cropland	9.1
Medium Residue Row Crop		1.9
Fair Pasture	Pastureland	2,500.7
Heavily Overgrazed Pasture		713.6
Orchard		58.8
Scrub/Shrub		554.7
Forest	Forest land	38,897.3
Clearcut		1,328.1
Active Strip Mines	Active Strip Mine	1,665.0
Tipples	Tipple	229.6
Reclaimed Strip Mine	Previously Mined Land	96.9
Abandoned with Highwall		4,808.6
Slide area		30.0
Contour Reclaimed		3,311.6
Slide		15.0
Abandoned Strip Mine		30.2
Borrow		45.3
Valley Fill		40.2
Disturbed Areas	Disturbed Areas	30.5
Abandoned Mine Features	Abandoned Mine Features	N/A
Stream Banks	Stream Banks	N/A
Unpaved Roads	Unimproved Roads	N/A
Road banks		N/A
Haul Roads		N/A
Livestock Access Areas	Livestock Access	N/A
Wetland	Wetlands	447.7
Open Water	Open Water/Flooded	384.0
Flooded		35.7
TOTAL		64,237.50

4.3 Water Quality Monitoring

There are multiple monitoring projects that have been performed in the Guest River Watershed which were used in both the assessment and TMDL study results. The biological and fecal coliform monitoring techniques are described in this section.

Sediment

Biological monitoring was used to determine the health of the benthic macroinvertebrate communities in the watershed. The aquatic life use impairment was identified through

benthic macroinvertebrate surveys. Benthic communities are used to monitor water quality changes since they are a fixed testimony to the conditions of the surrounding area. Their variable tolerance to pollutants helps monitors to derive stream conditions based on the diversity found in the community. Using ambient water quality monitoring, DEQ surmised that the impairment was due to loss of habitat from excess sediment in the stream.

The Biological and Ambient water quality monitoring histories are explained in the Guest River TMDL Study for Aquatic Life Use Impairment.

Biological Monitoring History - The biological sampling station location, 6BGUE006.50, was established 6.5 miles from the mouth of the river at the Route 72 bridge crossing over Guest River. On June 17, 1993, the benthic macroinvertebrate community was sampled using a United States Environmental Protection Agency (EPA) approved protocol. The Environmental Protection Agency approved Rapid Bioassessment Protocol 1 allows for identification of benthic macroinvertebrate communities to the Taxa level. The VADEQ identified the stream as moderately impaired in 1993. The field data showed high periphyton numbers, the habitat was sub-optimal and that there was low density of macroinvertebrates. These measurements for dissolved oxygen, pH and temperature meet water quality standards. There is no water quality standard for conductivity, however normal surface waters range between 10 and 100 micromhos per centimeter. Guest River partially supported aquatic life use for the 1996 Total Maximum Daily Load Priority List. In June 2002, the biologist re-visited sampling station 6BGUE006.50, rating the site as moderately impaired using Rapid Bioassessment Protocol 2. The data was compared to a reference stream, South Fork Holston River, to derive a rating. On May 8, 2002, the biologist established a probabilistic biological monitoring station, 6BGUE016.54, above the community of Tacoma off Alternate Route 58. Sampling results for this new upstream station were rated slightly impaired based on the same reference stream.

Ambient Water Quality Monitoring History - The DEQ ambient water quality monitoring station is located at the same Route 72 bridge as the biological monitoring station (6BGUE006.50). Additionally, the United States Geological Survey gage station that measures flow on the Guest River has operated at this bridge for many years. Water quality sampling, at this station, began in March of 1970. Samples were collected monthly until 1992 when the frequency was changed to sample quarterly. In 1996, sampling frequency changed again so sample collection occurred on a bimonthly basis. Current plans are to collect samples at this site for two years of a six-year cycle continuing with the bimonthly frequency. Parameters measured and reviewed for this study include: turbidity, alkalinity, biological oxygen demand, chemical oxygen demand, volatile solids, total suspended solids, volatile suspended solids, fixed suspended solids, total ammonia, total nitrite, total nitrate, nitrogen TKN, phosphate, total organic carbon, hardness, chloride, sulfate, and phosphate as total orthophosphate. Nutrients and low dissolved oxygen can contribute to benthic impairment. There is no indication that low dissolved oxygen is the reason for impaired macroinvertebrate health. Nutrients are not the stressor here either.
In 1997, DEQ analyzed sediment and fish tissue samples from the Guest River. Results for total DDT, total PAH and florene did not exceed the Effects Range Median. The fish

tissue results exceeded the screening values for mercury in a single species, PCB in two species and Total PAH in a single species. In 1998, fecal coliform violations resulted in listing the Guest River as a 303(d) segment for failure to support the Swimmable Use. The assessment data included results from Tennessee Valley Authority (TVA) as well as the DEQ sampling results. Fecal coliform violations do not affect aquatic life health. Consequently, this parameter is not the reason for the benthic impairment. Other parameters measured at this location have not violated water quality standards.
In December 2002, the DEQ staff collected water samples for a bioassay series funded by EPA Region 3. Growth/survival of fathead minnows and growth/reproduction of *Ceriodaphnia dubia* were measured using standard toxicity testing methods. Results of this study indicated no acute effects for either test organism, and subchronic effects on fathead minnow growth were too small to be considered biologically significant.

Bacteria

The bacteria monitoring for the three subwatersheds was summarized in the Sepulcher Creek, Toms Creek and Crab Orchard Branch Bacteria TMDLs.

Sepulcher Creek - The water quality monitoring station on Sepulcher Creek, station 6BSEP000.55, is about half mile above the confluence with Guest River. Initially, in 1996, this site was the only station on the stream and was identified as the railroad station because of the proximity of the railroad to the site. Eleven samples were collected at the railroad site during the summer (June and July) of 1996. The resulting geometric means were 158 colony forming units per 100 milliliters of sample water (cfu/100 ml) and 457 cfu/100 ml, the second one exceeded the fecal coliform geometric mean value of 200 cfu/100 ml thereby becoming a candidate impaired water. Samples were collected in March 1999 with a geometric mean result of 37 cfu/100 ml. In 2000, samples were collected at 6BSEP000.55, from January to August with all geometric means falling below the Virginia geometric mean standard. In 2001, results from June also show that the geometric mean complies with the water quality criteria. The second station was established in March of 1999 and a series of March 1999 samples had a geometric mean of 212 cfu/100 ml. In January 2000 this upstream station, 6BSEP00TVA, was sampled again with a geometric mean result of 364 cfu/100 ml. In 2001, only the railroad site, the downstream site was sampled with resulting geometric mean of 66. The stream remained on the 2002 TMDL list because the most recent data at the upstream site indicates there was a fecal coliform problem.

Toms Creek - Toms Creek station 6BTMS000.60, data had a geometric mean of 2,970 and 2,448 cfu/100 ml for the June and July 1996 samples. Little Toms Creek July 1996 data had a geometric mean of 1,950 cfu/100 ml. The one sampling event in June 1996 had 940 cfu/100 ml fecal coliform. Both sites clearly violated the fecal coliform geometric mean criterion and were listed for not supporting the swimmable use on the 1998 303(d) TMDL list. Data collected since the initial listing indicate a decreasing trend in fecal coliform contamination, however there are still violations of the instantaneous criteria so that they have remained on the TMDL list for not supporting the swimmable use.

Crab Orchard Branch - Crab Orchard Branch, station 6BCRA000.31, had geometric means of 985 cfu/100 ml and 578 cfu/100 ml during the same 1996 sampling timeframe. Six of the 11 samples for Crab Orchard Branch were higher than 1000 in 1996. In the subsequent 2002 assessment period, Crab Orchard Branch had no violations of 16 samples. Summer of 2001data collected on Crab Orchard Branch resulted in a geometric mean of 202, which is a violation of the standard so Crab Orchard Branch was retained on the 303(d) List for bacteria violations.

4.4 Sources of Pollutant

Pollutants, sediment and bacteria, in the Guest River watershed have been attributed to point and non-point sources based on the IPSI study. During the modeling for the TMDL studies, permitted point sources were identified and the total loads were accounted for as the wasteload allocation portion of the TMDL for each watershed. Because the nonpoint source contributions were much greater than the point source contribution, TMDL allocation reductions focused on nonpoint sources.

Sediment

The IPSI model requires information about the watershed landscape. Landscape features necessary for the geographic database include land cover (e.g. whether the land is pervious or impervious), streambank erosion, livestock operations and other land use information than affects pollutant delivery to the stream. In order to identify and quantify land use practices, Tennessee Valley Authority photographed the watershed from low altitude aircraft. Color-infrared photography allows photo interpretation of these land uses and inferences about the land cover. The land use and land cover classification scheme used is similar to the United States Geological Survey scheme for remote sensed data.

Once the photography is interpreted, and the inventory of landscape features is complete, the information is incorporated into a Geographic Information system (GIS). At the same time, the inventory, with associated attributes for each feature, is housed in Microsoft Excel spreadsheets. The Excel tables are set to calculate pollutant loads using the Universal Soil Loss Equation and other referenced equations. There are three components to calibration of the model; validation of the aerial photo interpretation, land use factor adjustments and comparison of model results to measured data.

The first component verified during the study is the aerial photography interpretation. Basically, the land use data catalogue is from the photo interpretation of aerial infrared photography, during leaf off conditions. Local agency staff compared land use maps generated from the photography and data available from local agencies. For example, coal-mining lands were broken into categories with the help of the Virginia Department of Mines, Minerals and Energy staff and their extensive geographic information system and water quality data. The number of acres of abandoned mine lands, active mines, pasture lands, urban lands and miles of roads in each sub-watershed were refined during this step.

The second calibration effort involved adjusting Universal Soil Loss Equation factors. The Universal Soil Loss Equation uses the annual average rainfall, slope length, soil erodibility, rainfall energy, crop management and erosion control practice factors. The Natural Resources Conservation Service district office and the Department of Mines, Minerals and Energy staff provided factors for erosion control practices. Visual examination of graphs for the relative contributions from each sub-watershed allowed confirmation of assumptions and expectations. The third calibration effort compares the total suspended solids water quality data to the model results. This comparison is between a regression of median sample concentrations multiplied by the watershed area and modeled loads. The results compared favorably with R2 = 0.83.

Land uses in the Guest River Watershed identify the sources of sediment. Unimproved roads can erode during rain events or contribute to soils washing off. Low or unvegetated areas can also have this problem during rainfall. This applies to pastures and abandoned mined lands. Livestock areas with direct access to the stream can contribute to streambank erosion and create paths for soils to wash off. Abandoned mined land (AML) areas occur in a variety of forms. Many Appalachian AML sites were created by "shoot-and-shove" mining, a common practice in steep-slope areas prior to Surface Mining Control and Reclamation Act of 1977, (SMCRA). The result was the characteristic highwall-bench-outslope terrain, which remains common in Appalachia today. "Shoot-and-shove" mining created numerous environmental problems; outslope spoils tend to be unstable when they became saturated with water and/or the pre-mining slopes exceeded 20^{o}. In some cases, outslopes contain pyritic spoils causing acid drainage. Pyritic and/or compacted surface spoils were slow to revegetate, and many such areas produce sedimentation. In the Guest River watershed, this appears to be contributing to the benthic impairment and reduction of TSS load is necessary to restore stream health. Highwall seeps can also act as sources of acid mine drainage. Abandoned deep mines are also responsible for many of today's AML environmental problems, due to the impacts of subsidence on the land surface and acid drainage from the deep-mine cavity. The creation of impervious surfaces through paving can also influence the amount of sediment reaching the streams. Since this run off from the different land uses is cumulative at the monitoring site, the reductions were created for each subwatershed of the Guest River.

Bacteria

Bacteria sources were identified using a combination of the aerial photo interpretation from the IPSI study and bacteria source tracking. During the bacteria TMDL study, water samples were collected at the mouth of each stream and analyzed to determine the source of the bacteria load. The four bacteria source categories identified were human, pet, livestock and wildlife. Allocation reductions were distributed between these categories.

4.5 TMDL Load Allocations

Sediment

Through a detailed Integrated Pollution Source Identification (IPSI) study, allocations, or maximum allowable loads, from each of the sources of sediment in the watershed were established to bring Guest River into compliance with the aquatic life use water quality standard. The following modeling scenario, Table 4.3, from the TMDL Study presents a set of sediment reductions needed to reduce the sediment loading to Guest River sufficiently to bring the river into compliance with the water quality standard for aquatic life use.

Table 4.3 TMDL Reductions in Loadings from Existing Conditions

Land Use Category	Existing TSS load (tons/year)	% Reduction	Stage 1 TSS load (tons/year)
Urban Land	4,666.6	10%	4,200.6
Cropland	7.3	0%	7.3
Pastureland	1,641.9	26%	1,219.4
Forest Land	4,535.7	0%	4,535.7
Active Strip Mine	17.8	0%	17.8
Tipples	1,323.1	74%	341.7
Previously Mined Land	5,181.8	38%	3,208.1
Abandoned Mine Features	1,943.8	100%	0.0
Disturbed Areas	781.8	25%	586.3
Stream Banks	331.1	18%	270.8
Livestock Access Areas	8.3	0%	8.3
Unimproved Roads	802.2	11%	714.1
Total NPS Load	**21,241.4**	**29%**	**15,110.1**

Bacteria

The bacteria TMDL study for the tributaries of the Guest River (Sepulcher Creek, Toms Creek and Crab Orchard Branch), approved by the US Environmental Protection Agency (USEPA) in May 2004, evaluated e.coli data taken within the three sub-watersheds using Bacteria Source Tracking (BST). Bacteria source tracking identifies the percentage of bacteria from a sample that can be associated with one of four source categories; human, livestock, pet and/or wildlife. Fecal Coliform and E. coli bacteria are excreted through the feces of warm-blooded animals. Their presence suggests a risk of higher levels of human illness upon contact with the water. Through a detailed examination of the data, allocations from each of the four sources of bacteria in the watershed were established to bring the three tributaries into compliance with the E. coli bacteria water quality criteria. Table 4.4 from the TMDL Study presents a set of e.coli bacteria reductions needed to reduce the bacteria loading to the three creeks sufficiently to bring them into compliance with the water quality criteria for e. coli bacteria.

Table 4.4 Average Annual load distribution, reduction, and allowable load by source for each impaired watershed

Sepulcher Creek Watershed					
	Total (cfu/yr.)	**Human @ 15% (cfu/yr.)**	**Pet @ 24% (cfu/yr.)**	**Livestock @ 31% (cfu/yr.)**	**Wildlife @ 30% (cfu/yr.)**
Average Annual Load	**1.11×10^{13}**	**1.64×10^{12}**	**2.70×10^{12}**	**3.45×10^{12}**	**3.30×10^{12}**
Reduction	**71%**	**71%**	**71%**	**71%**	**71%**
Allowable Annual Load	**3.19×10^{12}**	**0.48×10^{12}**	**0.78×10^{12}**	**1.00×10^{12}**	**0.96×10^{12}**
Toms Creek Watershed					
	Total (cfu/yr.)	**Human @ 17% (cfu/yr.)**	**Pet @ 17% (cfu/yr.)**	**Livestock @ 37% (cfu/yr.)**	**Wildlife @ 30% (cfu/yr.)**
Average Annual Load	**1.64×10^{14}**	**2.79×10^{13}**	**3.72×10^{13}**	**6.01×10^{13}**	**4.88×10^{13}**
Reduction	**84%**	**84%**	**84%**	**84%**	**84%**
Allowable Annual Load	**2.62×10^{13}**	**4.46×10^{12}**	**4.35×10^{12}**	**9.62×10^{12}**	**7.81×10^{12}**
Crab Orchard Branch					
	Total (cfu/yr.)	**Human @ 27% (cfu/yr.)**	**Pet @ 21% (cfu/yr.)**	**Livestock @ 18% (cfu/yr.)**	**Wildlife @ 34% (cfu/yr.)**
Average Annual Load	**1.74×10^{14}**	**4.70×10^{13}**	**3.65×10^{13}**	**3.13×10^{13}**	**5.92×10^{13}**
Reduction	**94%**	**94%**	**94%**	**94%**	**94%**
Allowable Annual Load	**9.98×10^{12}**	**0.28×10^{13}**	**0.22×10^{13}**	**0.19×10^{13}**	**0.36×10^{13}**

5.0 Public Participation

One of the critical components to the success of Guest River Implementation Plan has been the presence of the Guest River Group (GRG). The GRG consists of numerous federal, state and local agencies and organizations. Over the past six years, the GRG has spearheaded citizen monitoring efforts, outreach campaigns and corrective actions to improve water quality in the watershed. Consequently, the public was already familiar with water quality issues due to the GRG efforts and the framework of agency cooperation had been established.

5.1 Public meetings

The kick off meeting for development of an implementation plan coincided with the final public meeting held January 26, 2004 for the bacteria TMDL on Sepulcher Creek, Toms Creek and Crab Orchard Branch. Notice of this meeting was published in the Virginia Register and a local newspaper, The Coalfield Progress. Additionally, all members of the Guest River Group were notified of the meeting and the Department of Environmental Quality mailed out invitations to landowners along the three streams. Thirty-eight people attended. The Guest River Group Project Coordinator gave a presentation about implementation planning process and the public was encouraged to sign up for focus groups to provide input into the implementation plan. Interested citizens were invited to a series of focus group meetings set after the January 26, 2004 meeting.

On January 6, 2004 Muiread Craft, Guest River Coordinator, attended the Norton City Council meeting to present the TMDL Implementation Planning process and invite the City Council to participate. Similar presentations were given on January 12, 2004 to Coeburn Town Council, January 27, 2004 to Wise Town Council and February 5, 2004 to Wise County Board of Supervisors. April 8, 2004, Ms. Craft met with the Norton City Planning Commission to present the Implementation Plan Process upon the request of City Council.

After the Guest River Draft Implementation Plan was completed, each locality was encouraged to issue a resolution of support for the plan. These presentations occurred on, January 4, 2005 – City of Norton, January 6, 2005-Wise County Board of Supervisors, January 10, 2005- Coeburn Town Council and January 25, 2005-Wise Town Council. The Towns of Wise and Coeburn and the City of Norton passed resolutions of support for the plan. The Wise County Board of Supervisors requested an additional public meeting to be held to inform citizens of the Implementation Plan. The meeting was set for February 21st, 2005 at 6:30 p.m. at the Tacoma Community Center. Wise County staff will handle public notice for the meeting. Lonesome Pine SWCD staff will present at the meeting. The resolution of support has been moved to the agenda for the Wise County Board of Supervisors' meeting scheduled in March

5.2 Focus Groups

Urban Non-point Source Focal Group

On March 9th, 2004, the Urban NPS focal group met to discuss their confidence in the TMDL report and to gain insight into how they feel the implementation plan should be approached. The group listed tree blockage, which contributed to flooding, as an issue in the Guest River. Also mentioned was the trash which collected at these stream blockages and sewage, contributing to a foul odor of the river. The blockages cause a backup in the river system as sediments settle out. Trash settles on the streambank after times of high water. The participants felt sediment contributed to flooding in the river. They noted excess sediment running off of strip mines and from the roads.

The sources listed in the TMDL report were ranked in order of importance to be addressed. The participants ranked the sources with disturbed areas being most important followed by streambank erosion and general urban sources and finally road bank erosion. The group felt they did not have enough information on the TMDL report to judge their confidence in its findings. The group also did not have suggestions for reducing the amount of sediment reaching the river. They did suggest that a fact sheet would be helpful, listing the agencies involving in such matters and containing information on the Guest River Group and the TMDL report. Their suggestions for assistance people would need to address this problem included local government, local businesses and other agencies.

As for the role of the citizens in the implementation of the TMDL, they noted that citizens could do door to door surveys in their neighborhoods and take responsibility for spreading the information. As part of an education effort, information packets and media coverage could get the public to pay attention to the problems the river has. The citizens should also contact their elected representatives to inform them of the situation and request action be taken. The participants felt their quality of life would be improved if the Guest River was cleaned up because the beauty would be returned to the area, people could enjoy fishing and swimming once again and it would be better for tourism in the county.

Bacteria Focal Group:

On March 4th, 2004, the Bacteria focal group met to discuss their confidence in the TMDL report and to gain insight into how they feel the implementation plan should be approached. The focal group felt that the human contribution to the bacteria violations was the most important identified source to address, followed by pets and then livestock. They also felt that the human portion would be the most expensive to remediate, followed by livestock and then pets. They felt secure that the TMDL report had addressed all the sources of bacteria and confident in the numbers in the report. They perceive the presence of bacteria in the river to be a serious health issue. They felt that people should be concerned about the presence of bacteria as a health issue more than an environmental issue. They felt that although the Guest River has a large problem with the presence of bacteria, that the effects have been diminished by the public water supply.

The participants identified straight pipes, failing septic systems and failed sewage disposal designs as the source of the human contribution to the bacteria load. The proposed solution was a public sewer line for the county, including mini-treatment plants to eliminate pumping over the vast county to a central sewage treatment plant. To further reduce the cost of this type of project, homes deemed to be too remote can participate in a cost share program, similar to the one Guest River Group currently runs. Groups of homes can use a community system (similar to Imboden). For funding, the PDC could apply for grants for preliminary studies to determine which areas would require which type of corrective action.

For livestock, their presence near or directly in the stream accounts for their contribution. Participants identified three common BMP's; fence cattle out of the stream, find alternative water sources for livestock, and rotational grazing. Funding for these projects would come from the local Soil and Water Conservation Districts through their current cost share programs.

The contribution from pets to the bacteria load was identified as coming from deposits collected on people's property that runs off during rain events. This problem would require an education program for citizens about their pet waste. Also, a program encouraging spays and neutering would help reduce the pet population in the watershed.

The partners identified agencies to be involved with these suggestions. Human source corrective actions should involve Lenowisco Planning District Commission, local governments, Lonesome Pine Soil and Water conservation district and the Wise County Health Department. For livestock, the Lonesome Pine Soil and Water conservation district and possibly the Wise County Board of Supervisors (suggested an ordinance for the county) would aid with corrective actions. For pets source reductions, county government, local veterinarians, and the Wise County Board of Supervisors were identified as partners.

The participants felt the citizens would have to be involved. All of these suggestions should be completed with the cooperation of the community. Finding a personal connection with the landowners is important. We need to question the priorities in the county. Access to every person in the county is important for education on this topic.

Beside the obvious health benefits, the participants felt that it would be wonderful to be able to play in the creek again, and see wildlife and the aquatic life return. They felt that people would be proud to be from Wise County if the river was clean. Personally, it would give the participants peace of mind to know their health concerns with the river were being seriously addressed.

Some additional comments given included the following:

- A handbook/brochure about wastewater should be sent to all homeowners mentioning the significance of the pet contribution
- The wildlife contribution is very high, so working with agencies, hunting limits should be increased
- Livestock should be worked on first, then human and pet
- GRG should encourage involvement from the county (local government)

Agriculture and Forest land Focal Group

On March 11th, 2004, the agriculture and forest land focal group met to discuss their confidence in the TMDL report and how they feel the implementation plan should be approached. The group felt that it was necessary to mention that agriculture and forestland erosion problems were secondary to excess sediment caused by mining. This group felt that the excess sediment caused the river to be much more shallow than it was naturally. One participant recalled when a tributary near his home was dredged and after a 17-year period, it had filled up again with sediment, thereby making dredging only a temporary solution. They expressed that excess sediment load contributed to flooding and scoured the streambanks releasing more sediment into the river. Due to this scouring, trees planted on the river's edge are undercut, and eventually fall into the river causing more problems.

Of the sediment sources listed in the TMDL report, clearcuts were listed as the most important problem to address, followed by eroded streambanks, poorly vegetated areas (shrub/scrub areas) and then pasture run off. It is important to note the group felt clearcuts were important because, besides mining, the clearcuts at the headwaters of the Guest River start a chain reaction that they feel the whole watershed would benefit if that was dealt with first.

They had confidence that the TMDL report had addressed the forest sources, but felt the agriculture figures were inflated. The group felt that agriculture sediment runoff was not a problem in the Guest River. The group suggested stricter regulations on the reclamation for logging, more frequent and stricter inspections, more gravel on logging roads and fewer logging roads to cut down on the avenues sediment has to reach the river. The group felt a state agency would need to take the lead on these suggestions. The citizens' role in this would be to organize a citizen watchdog group that could report on violations to the state agency. The group felt a clean Guest River would mean a lot to people who live on the river, but also to the community, so they could fish and swim again.

Resource Extraction Focal Group

Although highly publicized efforts were made to engage a resource extraction focus group, the meeting on March 25th, 2004 attracted no willing participants. Since there were participants to all of the other focal groups, it was determined that sufficient efforts were made to attract interested parties. The technical advisory committee developed the implementation plan goals and objectives for this land use.

5.3 Steering Committee

The Steering Committee for the Guest River TMDL consisted of the Guest River Group along with additional stakeholders necessary for this undertaking. The advisors for the Technical Advisory Committees (TACs) were all on the Steering Committee. Bill Keith, with the Natural Resource Conservation Service, was the agriculture technical advisor. Jon Rockett, with the Powell River Project and Virginia Tech Cooperative Extension Agent, was the forestry technical advisor. Joey O'Quinn, with the Department of Mines

Minerals and Energy, was the resource extraction technical advisor. Shannon O'Quinn, with Tennessee Valley Authority, was the urban technical advisor.

5.4 Websites

The TMDL studies are available on the DEQ website at http://www.deq.state.va.us/tmdl. Also available on the website are the comments from the public and the EPA rationale for approval of the TMDL studies.
The Guest River Group website, http://www.guestriverproject.org, is a resource for the public to learn about the issues facing the watershed, including those in the TMDL studies.

5.5 Media

Notices for the January 26, 2004 public meeting appeared in the issues of the Coalfield Progress Newspaper and the Kingsport Times News. Notice of this meeting also appeared in the Virginia Register. News Channel Five interviewed Muiread Craft, Coordinator for the Guest River Group, at this meeting.

5.6 Mailings

Citizens from the watershed were invited to the January 26, 2004 meeting via a postcard shown below. The addresses were compiled from Guest River Group sign up sheets, posted at various community events, such as the Wise County Fair, the Guest River Rally, and the Wise Fall Fling. Additionally, since the kickoff meeting for the implementation planning process coincided with the final public meeting for the bacteria TMDL, the DEQ mailed invitations to residents in Sepulcher Creek, Toms Creek and Crab Orchard Branch.

Figure 5.1 Depiction of postcard sent to Guest River stakeholders

Be involved in the creation of the plan to resolve our bacteria and sedimentation problems in the Guest River!

The Guest River Group invites you to a Public Stakeholder's Meeting January 26, 2004 @ 6:30 p.m.

@ The Tacoma Community Center

More information about this meeting is available by contacting:
Lonesome Pine Soil and Water Conservation District,
Rt. 2, Box B, Clintwood, VA 24228,
Telephone (276) 926-6621, Fax (276) 926-4640,
or e-mail muiread-craft@va.nacdnet.org

6.0 Implementation Actions

6.1 Introduction

The TMDL studies had low detail of analysis, including temporal monitoring, simple source assessment and simple modeling. A simple source assessment includes waste load allocations to each permitted point source within the watershed and NPS load allocations to broad categories of sources within the watershed. In the Guest River there are two pollutants, sediment and bacteria. The aquatic life use impairment TMDL used the IPSI is a sediment and nutrient loading estimate model. The bacteria TMDL NPS allocations were made based on BST data using the broad categories of human, livestock, pet and wildlife.

Sediment

The Guest River is in violation of the general water quality criteria for aquatic life use impairment. This impairment was identified through benthic macroinvertebrate surveys. The impaired benthic community was attributed to sedimentation in the Guest River watershed. Benthic macroinvertebrates are bottom dwelling organisms that are large enough to see with the naked eye. They consist of insects, mollusks, crustaceans and annelid worms. Benthic communities are used to monitor water quality changes since they are a fixed testimony to the conditions of the surrounding area. Their variable tolerance to pollutants helps monitors to derive stream conditions based on the diversity found in the community.

Sediment in the Guest River Watershed is attributed to historical resource extraction, urban runoff, stream bank erosion and agricultural production. Excess sediment in the stream can clog up habitat for benthic macroinvertebrates. It was concluded by DEQ biologists that the benthic impairment was attributed to loss of habitat due to excess sediment in the stream.

Bacteria

Sepulcher Creek, Toms Creek and crab Orchard Branch have been listed for bacteria impairments. Multiple samples were collected over the period of a month and this data along with instantaneous criteria were used to determine violations of the water quality standard.

The TAC for the Guest River TMDL studies divided the watershed into different land uses and sources of pollution. The TAC put together teams to address the implementations actions necessary to address the issues for each of these areas. The teams included Urban Non-point Source (NPS) Pollution, Agriculture, Resource Extraction and Forestry. Each team addressed the allocations in the TMDL studies that dealt directly with their land uses. Multiple teams dealt with some of the reductions, such as streambank erosion, with Agriculture and Urban NPS teams both addressing this issue from their respective expertise.

6.2 Legal and Regulatory Controls

Urban Nonpoint Source

The Code of Virginia 10.1-561, the State Erosion and Sediment Control Program provides guidelines for sediment prevention. A network of local government-operated ESC programs regulate most private projects involving a land-disturbing activity, while DCR's ESC Program staff oversees state and federal activities. Wise County has a building and zoning ordinance as well as an Erosion and Sediment Control Ordinance in the County Code. Additionally the Stormwater Management Regulations 10.1-603.1 in the Code of Virginia require best management practices when lands are disturbed during construction activities.

The goal of the Erosion and Sediment Control Program is to control soil erosion, sedimentation, and nonagricultural runoff from regulated "land-disturbing activities" to prevent degradation of property and natural resources. The regulations specify "Minimum Standards," which include criteria, techniques and policies, which must be followed on all regulated activities.

While property owners are ultimately responsible for Erosion and Sediment Control plan approval and implementation, responsibility for ensuring compliance extends to the developer, contractor, consultant and Virginia's citizenry at-large. The successful execution of Erosion and Sediment Control programs affects a variety of interests, from anyone who owns, rents or develops property to those who reside or recreate on lands or waters adjacent to or downstream from land-disturbing activities.

Agricultural Nonpoint Source

Agricultural Stewardship Act created by Chapter 5 in Title 10.1 of the Code of Virginia provides a framework to enforce best management practices on agricultural lands. It provides opportunities to farmers to correct water quality impairments voluntarily before any enforcement action is taken. The Agricultural Stewardship Act program is administered by the Virginia Department of Agriculture and Consumer Services Commissioner's Office, which will receive all complaints. If a complaint is under the jurisdiction of the Agricultural Stewardship Act, the local Soil and Water Conservation District is contacted and given the opportunity to investigate. After a complaint is investigated, the Commissioner's Office reviews the findings and determines if the complaint is founded and requires further action under the Agricultural Stewardship Act. If so, the farmer is required to develop a plan to correct the problem and then complete plan implementation within eighteen months. The Commissioner's Office contacts complainants to inform them of the findings.

Resource Extraction Nonpoint Source

SMCRA requires best management practices to reduce sedimentation. Abandoned mined lands (AML) are areas that were mined prior to implementation of federal controls over coal mined land reclamation and inadequately reclaimed. Previously mined lands, as

defined in the Guest River TMDL, includes all lands previously disturbed by coal mining. Previously mined lands contain areas that have been properly reclaimed, such as older reclaimed contour surface mines, as well as, areas of AML and abandoned mined land features. The Guest River TMDL calls for reductions in Total Suspended Solids (TSS) loads from previously mined lands and abandoned mined land features. The reductions are proposed to be obtained for these land use categories through remining.

The federal Surface Mining Control and Reclamation Act (SMCRA) was signed into law in 1977. One of SMCRA's stated goals was to:

"promote the reclamation of mined areas left without adequate reclamation prior to the enactment of this Act and which continue, in their unreclaimed condition, to substantially degrade the quality of the environment, prevent or damage the beneficial use of land or water resources, or endanger the health or safety of the public" [102(h)].

Forestry Nonpoint Source

Best management practices to reduce sedimentation due to forest harvesting are also required. The Code of Virginia currently requires notification to VDOF of the commencement of silvicultural operations. It also provides for corrective action if the operation is causing or is likely to cause pollution. This is an environmental protection program already in place designed to ensure that silvicultural activities, such as logging, do not contribute to water quality impairments. VDOF conducts an inspection of all operations identified within 15 days and every 30 days thereafter until the job is satisfactory "closed out".

6.3 Assessment of Implementation Action Needs

In developing the Implementation Plan for the Guest River TMDL studies, the Technical Advisory Committee (TAC) attempted to emphasize existing programs and efforts that promote water quality. This approach allows for the utmost benefits while reducing the duplication of efforts. However, many of the traditional assistance programs are not available due to limitations in local funding or program constraints. Therefore the implementation actions outlined here include new efforts targeting reductions to sediment and bacteria loading.
This chapter of the IP organizes the teams' findings for needed implementation actions. Each team has delivered a combination of pollution prevention, mitigation measures and indirect measures required to achieve the desired reductions.

Urban Non-Point Source Implementation Actions:

The Urban NPS team addressed the following reductions outlined in the TMDL studies:

- Bacteria - Reductions of bacteria loading from human and pet sources in Sepulcher Creek, Toms Creek and Crab Orchard Branch
- Sediment - Reduce the residential urban sources by 60%, all other urban sources by 50%, (urban related) disturbed areas by 70%, and road bank erosion by 50%
- Sediment - Repair ½ of eroding stream banks (in urban areas)

From the IPSI report prepared by TVA, there are 164 identified suspected sites in the three subwatersheds that are in need of septic system installation or repair. 90 percent of the 1,303 buildings located in Sepulcher Creek, Toms Creek, and Crab Orchard Branch are located in the non-sewered zones, so they are using other methods to handle sewage. 9 percent of the households in Sepulcher Creek have failing systems, 16 percent in Toms Creek and 100 percent in Crab Orchard branch, according to the IPSI. Maps from the IPSI show that the majority of these sites are located within 1 mile of the impaired streams. The Guest River Group has provided cost share assistance to homeowners since 1999 in the watershed through grant funds. The Guest River Group would restructure this program to offer this funding to home and business owners in Sepulcher Creek, Toms Creek and Crab Orchard Branch.

To begin implementation, the sites identified by the IPSI report would need to be verified by on the ground personnel. As sites are verified, assistance can be offered to the landowner. In order to accomplish this effort, the Wise County Health Department will require additional staff. The WCHD has agreed to provide office space, equipment and supervision to an AmeriCorps VISTA volunteer, a cost share position. Sites capable of being repaired with a traditional septic system with a gravity flow drainfield would be priority. This IP will defer to the sewer study currently being commissioned by the Lenowisco Planning District Commission. The intention of the sewer study is to be used to determine the most cost effective means of providing adequate public wastewater collection and treatment services to the residents, using traditional sewer systems and innovative solutions for Guest River communities.

Once completed, the sewer study, will list project opportunities for wastewater disposal systems to best serve populations in "hard to serve" communities. The study will examine the service areas, to include the subwatersheds in this TMDL study. The study will identify deficiencies in the current sewer services and propose solutions to isolated communities where conventional systems are not practical. The study will be accompanied by an implementation plan to carry out the findings of the report, to include cost estimates. The study will also report funding for the projects.

For the urban source sediment reductions, the TAC proposes several actions. Once a survey of critically eroding areas is complete, implementation of erosion and sediment control practices can begin. A hotspot analysis in the towns of Wise and Coeburn and the City of Norton will be required to identify residential, commercial and industrial sites that will require stormwater retrofits. Retrofits are stormwater management measures for urban watersheds designed to help minimize accelerated channel erosion, reduce pollutant loads and promote conditions for improved aquatic habitat. These best management practices are inserted in an urban landscape where little or no prior stormwater controls existed. There are approximately 7944 acres of land in urban use in the Guest River watershed. A 60% reduction of sediment sources is needed. Of that amount, stormwater retrofits could be the solution. A staff person capable of working in all Guest River communities is needed to implement these actions. The Wise County Building and Zoning Office has agreed to house such an employee. This person would implement the stormwater retrofits and work with residents to install stormwater projects such as rain gardens and rain barrels. One case study for urban stormwater retrofits showed an average cost of $640,000 per square mile of drainage area. Until an inventory

is completed such that candidate stormwater improvement sites are identified, a final cost figure will be unavailable.

There are multiple stormwater retrofits available to reduce sediment. Vegetative controls include vegetative buffer strips, grassed swales and bioretention (rain gardens). Stormwater wetlands remove sediment through gravitational settling. Street sweeping is already in place in the City of Norton and the Town of Wise. The table below presents some of the Total Suspended Solids (TSS) removal rates for these control measures.

Table 6.1 Urban Best Management Practices Removal Rates for TSS

Retrofit	Removal Rate for Total Suspended Solids (TSS)
Vegetative Buffer Strip	54%
Grassed Swales	75 - 95 %
Wetlands	75%
Street Sweeping	56%

According to the Nonstructural Urban BMP Handbook,
prepared by the Northern Virginia Planning District Commission

Some sediment reductions will be achieved by plans already in place by localities. The Town of Wise has received a $2.5 million grant from FEMA to implement a floodplain buyout in the Yellow Creek subwatershed. The town is currently assessing the area and public interest in the buy out program, so the area to be changed from impervious to pervious is yet undetermined. The City of Norton has received a $3 million grant to upgrade the stormwater drainage system. In addition to these actions, workshops for local governments and developers will be made available on low impact development. Localities will receive assistance in reviewing and revising ordinances to allow for consideration of stormwater issues.

Agriculture Implementation Actions:

The Agriculture team addressed the following reductions outlined in the TMDL studies:

- Bacteria - Reductions of loading from livestock sources in Sepulcher Creek, Toms Creek and Crab Orchard Branch
- Sediment and Bacteria - 100% overgrazed pasture improved to fair, 75% of fair pasture improved to good
- Sediment - Reduce (agriculture related) disturbed areas by 70%
- Sediment - Repair ½ of eroding stream banks (in agriculture areas)

The Agriculture team identified Best Management Practices (BMPs) for pollution prevention in the watershed. The Guest River Watershed is not known as an agricultural watershed due to a large percentage of land use being dedicated to forestry and resource extraction. However, there are approximately 97 farms located within the watershed boundaries. Although there are few that depend on farm income as the sole source of income, most still fit the family farm concept where farm resources still produce food and supplemental family income.

The most common agricultural concern for the Guest River is small livestock operations that include beef cattle and horses. Most usually, the farmers use surface water resources for the livestock by allowing the livestock free access to surface streams, ponds and wetlands. Since the Guest River watershed is not rated as HIGH in regards to agricultural sediment and nutrient loading, the farms traditionally have not been competitive in agricultural cost share programs.

Control measures include the exclusion of livestock from the Guest River and its tributaries, installation of forest riparian buffers, and the installation of alternative watering systems. To improve cover on pastureland, the placement of the alternative watering facilities becomes a critical component to promote better grazing distribution. In addition to grazing distribution, the addition of division fencing would allow livestock producers to move toward management of intensive grazing.

Of the approximate 3200 acres of pastureland identified within the watershed, 700 acres have been deemed as severely overgrazed which will also require agronomic practices (pasture seeding and nutrient management). Remote sensing using aerial photography identified these acreages. According to the IPSI inventory, there are 32 beef cattle operations (see Table 6.1 and 6.2) within the Guest that are adjacent to streams. These would be the first farms targeted for potential livestock exclusion and riparian forest buffer establishment. For the relatively small farms within the Guest, an "average value" for exclusion is 1000 linear feet of stream, most of which would require fencing on both sides of the stream. This average would indicate a potential for 64,000 feet of fencing needed.

Table 6.2 Beef Cattle sites in the Guest River Watershed

			Number of sites							
			Adjacent to Stream				Non-adjacent to Stream			
Subwatershed Name	Subwatershed ID	Total	Large	Medium	Small	Subtotal	Large	Medium	Small	Subtotal
Guest River A	01	7	0	2	1	3	0	0	4	4
Crab Orchard Br.	0201, 0202	3	0	0	2	2	0	0	1	1
Guest River B	02, 03	2	0	0	0	0	0	0	2	2
Pine Camp Cr.	0401, 0402	3	0	0	0	0	0	0	3	3
Guest River C	04, 05	0	0	0	0	0	0	0	0	0
lower Toms Creek	0601	0	0	0	0	0	0	0	0	0
Little Toms Cr.	060201, 060202	5	0	0	3	3	0	0	2	2
upper Toms Creek	0602, 0603, 0604	15	0	1	7	8	0	0	7	7
Guest River D	06, 07, 08, 09	8	0	2	2	4	0	0	4	4
Burns Cr.	1001, 1002	0	0	0	0	0	0	0	0	0
Guest River E	10, 11	2	0	0	0	0	0	0	2	2
Guest River F	12	0	0	0	0	0	0	0	0	0
lower Bear Cr.	1201, 1202	1	0	1	0	1	0	0	0	0
Yellow Cr.	120301, 120302	6	0	1	0	1	0	0	5	5
upper Bear Cr.	1203, 1204	8	0	1	2	3	0	1	4	5
Clear Cr.	1301, 1302	0	0	0	0	0	0	0	0	0
Guest River G	13, 14	2	0	0	2	2	0	0	0	0
Sepulcher Cr.	1501, 1502	5	0	0	3	3	0	0	2	2
Guest River H	15, 16, 17	9	0	0	2	2	0	0	7	7
Guest River I	18	1	0	0	0	0	0	1	0	1
	Total sites	77	0	8	24	32	0	2	43	45

Table 6.3 Horse Livestock sites in the Guest River Watershed

			Number of sites							
			Adjacent to Stream				Nonadjacent to Stream			
Watershed Name	Watershed ID	Total	Large	Medium	Small	Subtotal	Large	Medium	Small	Subtotal
Guest River A	01	0	0	0	0	0	0	0	0	0
Crab Orchard Br.	0201, 0202	1	0	0	0	0	0	0	1	1
Guest River B	02, 03	1	0	1	0	1	0	0	0	0
Pine Camp Cr.	0401, 0402	1	0	0	0	0	0	0	1	1
Guest River C	04, 05	0	0	0	0	0	0	0	0	0
lower Toms Creek	0601	0	0	0	0	0	0	0	0	0
Little Toms Cr.	060201, 060202	0	0	0	0	0	0	0	0	0
upper Toms Creek	0602, 0603, 0604	5	0	0	1	1	0	0	4	4
Guest River D	06, 07, 08, 09	2	0	0	0	0	0	0	2	2
Burns Cr.	1001, 1002	0	0	0	0	0	0	0	0	0
Guest River E	10, 11	0	0	0	0	0	0	0	0	0
Guest River F	12	0	0	0	0	0	0	0	0	0
lower Bear Cr.	1201, 1202	1	0	0	0	0	0	0	1	1
Yellow Cr.	120301, 120302	5	0	0	0	0	0	0	5	5
upper Bear Cr.	1203, 1204	2	0	0	0	0	0	0	2	2
Clear Cr.	1301, 1302	0	0	0	0	0	0	0	0	0
Guest River G	13, 14	0	0	0	0	0	0	0	0	0
Sepulcher Cr.	1501, 1502	1	0	0	0	0	0	0	1	1
Guest River H	15, 16, 17	1	0	0	0	0	0	0	1	1
Guest River I	18	0	0	0	0	0	0	0	0	0
	Total sites	20	0	1	1	2	0	0	18	18

In addition, many of the streams used by livestock are experiencing erosion and are in need of stabilization techniques. One conservation plan example may include streambank stabilization, streambank fencing, riparian forest buffer establishment, an alternative watering system as well as potentially treating overgrazed fields with pastureland seeding, lime and fertilizer.

Although there are horse operations adjacent to streams, horses have less impact on streambank stability but a much greater impact on pasture cover. Many local examples can be seen of pasture overstocking that result in low or NO vegetative cover. Rotational grazing practices can be utilized with horses to protect and maintain vegetation although most operations would need to reduce animal density. Alternative conservation practices specific to horse production and horse barn management (how manure is collected, stored and utilized).

Nutrient Management Planning

The pastureland in the Guest River is typically low in available nutrients (macro and micro) as well as organic matter. Offering comprehensive nutrient management planning is also an important step in treating agricultural lands within the watershed. The application of municipal waste is a valid alternative within the watershed. Currently, most of the waste produced in the region is placed in landfills; however many farmers are becoming aware of the opportunity to use the processed waste material for nutrient application for forage production. Several local examples are demonstrating how these materials are increasing ground cover, thereby reducing soil erosion, and increasing the productivity of reclaimed mined lands used as pasture and hay land. The important component is to insure quality nutrient management planning is provided and adequate oversight to insure compliance with applicable regulations.

Resource Extraction Implementation Actions:

The Resource Extraction team addressed the following reductions outlined in the Aquatic Life Use TMDL:

- Sediment - Repair all abandoned mine features
- Sediment - Full cover on 100% of previously mined land
- Sediment - 90% reduction of sediment delivery from tipples in Sepulcher Creek

Abandoned mined lands (AML) are areas that were mined prior to implementation of federal controls over coal mined land reclamation and inadequately reclaimed. Previously mined lands, as defined in the Guest River TMDL, includes all lands previously disturbed by coal mining. Previously mined lands contain areas that have been properly reclaimed, such as older reclaimed contour surface mines, as well as, areas of AML and abandoned mined land features. The Guest River TMDL calls for reductions in Total Suspended Solids (TSS) loads from previously mined lands and abandoned mined land features. The reductions for these land use categories are proposed to be obtained through remining.

Unmined coal reserves remain in place on many AML areas. When AML are re-mined and reclaimed by active operations, results can include production of otherwise-unmineable coal resources and reduction of adverse impacts to water quality from previous mining. Public benefits would result from a regulatory strategy, including Total Maximum Daily Load Implementation Plans, that emphasized full extraction of remaining coal resources on AML sites while reclaiming the site and closing out the cycle of mining.

In some cases (i.e., where an adjacent AML site provides cost-effective opportunity for excess spoil disposal, or where the additional area created by extending effective site boundaries allows an operator to conduct operations more efficiently), voluntary reclamation under a no-cost contract can create economic advantages to a remining operator.

AML areas are common in Appalachian areas today, while opportunities for reclamation of such areas by the AML Fund are limited. Many AML features lie in close proximity to mineable coals. Given the AML Fund's limitations, remining can be seen as a reasonable and low-cost means for achieving reclamation of such areas. Continued development of mechanisms to allow greater AML reclamation through re-mining would allow limited AML Fund resources to be concentrated on reclaiming AML that is not in proximity to mineable coals. Achieving greater AML reclamation through remining will require regulatory innovation and flexibility but current successes in remining make it the viable implementation plan for the Guest River. Based on DMME tracking data from YR 2001, YR 2002, and YR 2003, re-mining currently permits approximately 4,377 acres annually in Virginia's coalfields. Based on that rate as compared to total AML acres (see Table 6.3) and the Guest River AML acres, the AML acreage and associated TSS load in the Guest River could be reduced by 38% (phase I) in 4.57 years and by 77% in 9.27

years if remining would be conducted within the watershed at the same rate it is occurring throughout Virginia's coalfields.

Table 6.4 AML reclamation implementation timeline

Land Use Category	Pollution Load	Reduction needed	Planned implementation	Timeline For Phase 1 reductions	Timeline For Final Reductions
AML	38%	77%	Remining & AML Program	5 years	10 years
Abandoned Mine features	100%	100%	Remining & AML Program	10 years	10 years

Implementation plans for active coalmines and tipples.

The Guest River TMDL calls for 0% reduction in existing load from active strip-mined lands as these land uses falls under current SMCRA permitting requirements and have mandatory BMPs and assigned effluent limits. The load developed for this land use will be tracked by Virginia DMME and DEQ to insure that future NPDES and VPDES dischargers don't exceed the Waste Load Allocation included in the TMDLs.

Many tipples are not covered by SMCRA and do not have assigned effluent limits. The TMDL calls for a 74% stage 1 reduction in TSS for these facilities and a 90% final reduction (Table 6.4). The implementation plan for these tipples would be the voluntary installation of BMPs facilitated by the Guest River Group. The Guest River Group has been very successful in obtaining grant funding for resource extraction projects. Partnering with other agencies and organizations has been an extremely valuable tool in the Guest River Group's efforts to reclaim environmental problems. Since the organizations inception in 1996, the Group has partnered with DMME, the Natural Resources Conservation Service, the Black Diamond Resource Conservation and Development, Virginia Department of Transportation, and the Tennessee Valley Authority to reclaim several priority 3 sites in the Guest River watershed. The Group has averaged about a site per year – utilizing a variety of funding sources. Application of the same methods and efforts toward the tipples within the watershed that have been historically utilized by the Group to address priority 3 AML is a reasonable approach. Final stage and stage 1 reductions of TSS can be achieved in the same general timeframe that is proposed for the abandoned mined land features.

Table 6.5 Tipples BMP installation timeline

Land Use Category	Pollution Load	Reductions needed	Planned implementation	Timeline For Phase 1 reductions	Timeline For Final Reductions
Tipples	74%	90%	Volunteer facilitated by Guest River Group	5 years	10 years

Forestry Implementation Actions:

The Forestry team addressed the following reductions outlined in the Aquatic Life-Use TMDL:

- Sediment - Reduce clearcut area load by 25% and improve shrub/scrub areas to 100% cover

The Code of Virginia currently requires notification to VDOF of the commencement of silvicultural operations. It also provides for corrective action if the operation is causing or is likely to cause pollution. This is an environmental protection program already in place designed to ensure that silvicultural activities, such as logging, do not contribute to water quality impairments. VDOF conducts an inspection of all operations identified within 15 days and every 30 days thereafter until the job is satisfactory "closed out".

§ 10.1-1181.2. Conduct of silvicultural activities; issuance of special orders.

A. If the State Forester believes that an owner or operator has conducted or is conducting or has allowed or is allowing the conduct of any silvicultural activity in a manner that is causing or is likely to cause pollution, he may notify the owner or operator regarding the activity that is causing or likely to cause pollution and recommend (i) corrective measures and (ii) a reasonable time period to prevent, mitigate, or eliminate the pollution. If the owner or operator fails to take action to prevent, mitigate, or eliminate the pollution, the State Forester shall issue a special order pursuant to subsection B or C. Failure of the State Forester to notify an owner or operator of such corrective measures shall not impair the State Forester's authority to issue special orders pursuant to subsection B or C.

B. The State Forester shall have the authority to issue special orders to any owner or operator who has conducted or is conducting, or has allowed or is allowing to be conducted, any silvicultural activity in a manner that is causing or is likely to cause pollution, to cease immediately all or part of the silvicultural activities on the site, and to implement specified corrective measures within a stated period of time. Such special orders are to be issued only after the owner or operator has been given the opportunity for a hearing with reasonable notice to the owner or operator, or both, of the time, place and purpose thereof, and they shall become effective not less than five days after service as provided in subsection D.

C. If the State Forester finds that any owner or operator is conducting any silvicultural activity in a manner that is causing or is likely to cause an alteration of the physical, chemical or biological properties of any state waters resulting from sediment deposition presenting an imminent and substantial danger to (i) the public health, safety or welfare, or the health of animals, fish or aquatic life; (ii) a public water supply; or (iii) recreational, commercial, industrial, agricultural or other reasonable uses, the State Forester may issue, without advance notice or hearing, an emergency order directing the owner or operator, or both, to cease immediately all or part of the silvicultural activities on the site, and to implement specified corrective measures within a stated period of time. The commencement of proceedings by the State Forester for the issuance of a special order pursuant to subsection B shall not impair the State Forester's authority to issue an emergency special order pursuant to this subsection. The State Forester shall provide an

opportunity for a hearing, after reasonable notice as to the time and place thereof to the owner or operator, to affirm, modify, amend or cancel such emergency special order.

D. The owner or operator to whom such special order is directed shall be notified by certified mail, return receipt requested, sent to the last known address of the owner, or operator, or by personal delivery by an agent of the State Forester, and the time limits specified shall be counted from the date of receipt.

E. The State Forester shall not issue a special order to any owner or operator who has incorporated generally acceptable water quality protection techniques in the operation of silvicultural activities, which techniques have failed to prevent pollution, if the State Forester determines that the pollution is the direct result of unusual weather events that could not have been reasonably anticipated.

F. Any hearing required under this section shall be conducted in accordance with § 2.2-4020 unless the parties consent to informal proceedings.

G. The State Forester shall not issue a notice under subsection A or a special order or emergency special order under subsection B or C more than one year after the silvicultural activity has occurred on the property. Any such notice, special order, or emergency special order shall remain in effect until the State Forester determines that corrective measures specified therein have been implemented.

H. Prior to completion but not later than three working days after the commencement of an operation, the operator shall notify the State Forester of the commercial harvesting of timber. For the purpose of this section, commercial harvesting of timber means the harvesting of trees for the primary purpose of transporting to another site for additional manufacturing. The notification may be verbal or written and shall (i) specify the location and the actual or anticipated date of the activity and (ii) be made in a manner prescribed by the State Forester. If an operator fails to comply with the provisions of this subsection, the State Forester may assess a civil penalty of $250 for the initial violation and not more than $1,000 for any subsequent violation within a 24-month period by the operator. Such civil penalties shall be paid into the state treasury and credited to the Virginia Forest Water Quality Fund pursuant to § 10.1-1181.7.

(1993, c. 948; 1998, c. 578; 2002, cc. 293, 304, 376; 2003, c. 812; 2004, c. 228.)

Being that this protection is already in place by the Code of Virginia, the actions necessary to achieve this reduction is better arrived at through outreach. Best Management Practice (BMP) training for loggers has been conducted at the Powell River Project Research & Education Center in September 2002, 2003 and 2004. This training is lead by Jim Willis, Extension Forester, and supported by Jon Rockett, Extension Agent and agency staff from VDOF. The Guest River Group would like to see type of training continue in the watershed to keep local loggers up to date with the newest BMP measures and proper BMP installation.

An additional component to the outreach program would be landowner training. Landowners can be held responsible for pollution and therefore should have an appropriate contract in place prior to the initiation of forestry operations. The task for the Guest River Group would be a mass media campaign to educate landowner in the

watershed of their responsibilities. Not only would this educate those with forest stands, but also those citizens that live near a forest stand. Citizens have proven a useful tool in reporting activities in the watershed and could report any logging activity that VDOF has not been informed of through proper channels.

6.4 Assessment of Technical Assistance Needs

Sufficient technical assistance and education are keys to getting citizens involved in implementation. There must be a proactive approach by agencies to contact landowners in the impaired watersheds to articulate exactly what the TMDL process means to them and what will most practically get the job done. Workshops and demonstrations begun by the Guest River Group can be continued to show landowners the extent of the problem, effectiveness of BMPs, and process involved in obtaining technical and financial assistance.

The Lonesome Pine Soil and Water Conservation District has employed the Project Coordinator for the Guest River Group since its inception. The LPSWCD will convert this position to a full time TMDL coordinator. This position will coordinate the implementation actions and seek the funding to complete the project within the timeline given for this plan.

Years	Resource Extraction Technical Assistance (Man years)	Resource Extraction Technical Assistance $	Total Cost
	LPSWCD Full-time	LPSWCD	
IY 1	1	46,000	46,000
IY 2	1	46,000	46,000
IY 3	1	46,000	46,000
IY 4	1	46,000	46,000
IY 5-IY 10	6	276,000	276,000
Totals	10		460,000

Urban nonpoint source

The Wise County Health Department has been the primary organization for managing residential programs. However, depending on the extent of reductions needed, the WCHD may not have resources to fully commit to implementation. In previous TMDL implementation projects, the local SWCD has taken the lead (with VDH consultation) on implementing residential implementation actions. Additional technical assistance may be provided through homeowners associations such as *Banner Knockus*. Technical assistance estimates for the implementation plan include two additional individuals. An erosion and sediment control specialist, housed in Wise County Building and Zoning Office would be an additional individual brought in to address the sediment issues in the watershed. Additionally, one VISTA Volunteer is needed to address sanitary sewer

needs in the watersheds. The VISTA Volunteer will be housed within the Wise County Health Department.

Years	Urban Technical Assistance (Man years)		Urban Technical Assistance $		Total Cost
	Full-time	VISTA Volunteer	Full-time	VISTA	
IY 1	1	1	46,000	10,000	56,000
IY 2	1	1	46,000	10,000	56,000
IY 3	1	1	46,000	10,000	56,000
IY 4	1		46,000		46,000
IY 5-IY 10	6		46,000		276,000
Totals	10	3			490,000

Small community meetings (similar to the small workshops proposed for the agricultural community) could be the best forums for educating homeowners about environmental issues and management considerations (*e.g.*, septic system maintenance and disposal of pet waste). Generally, homeowners are unaware of the need for regular septic system maintenance. Notices using all media outlets will continue to be posted regarding septic systems (*e.g.*, a reminder to pump-out septic tank every three to five years). An educational packet developed by the Guest River Group can be included about septic system issues for new homeowners. Additionally, educational tools, such as a model septic system that can be used to demonstrate functioning and failing septic systems, and video of septic maintenance and repair is useful in communicating the problem and needs to the public.

Agriculture

Historically, SWCDs and the NRCS have taken the lead for agricultural technical assistance in Virginia. The level of technical assistance that a full time equivalent (FTE) can be expected to provide during a year was estimated using available resources. The Lonesome Pine Soil and Water Conservation District is located in Clintwood but serves all of Wise and Dickenson Counties. There is one district conservation specialist dividing time between two counties, which results in one-half FTE for the Guest River Watershed Implementation Plan. There is also an NRCS district conservationist (DC) available to implement the agricultural goals. The DC serves both Lonesome Pine and Big Sandy SWCDs resulting in another half FTE. It is anticipated ¾ FTE will be dedicated to technical assistance on design and installation of implementation actions and that the remaining ¼ FTE will be devoted to educational outreach.

Years	Agricultural Technical Assistance (Man years)		Agricultural Technical Assistance $		Total Cost
	SWCD Full-time	NRCS Full-time	SWCD Full-time	NRCS	
IY 1	0.5	0.5	23,000	50,000	83,000
IY 2	0.5	0.5	23,000	50,000	83,000
IY 3	0.5	0.5	23,000	50,000	83,000
IY 4	0.125	0.125	5,750	12,500	18,250
IY 5-IY 10	.75	.75	34,500	75,000	109,500
Totals	2.375	2.375			376,750

The best forum for the agricultural community may be field days, pasture walks, and presentations offered through local farm groups. Emphasis should be placed on local farmers discussing their experiences with the cost-share programs, demonstrating the advantages of a BMP, and presenting monitoring results to demonstrate the problem. Farmers are more likely to be receptive to individualized discussions with local technical personnel or fellow farmers who have implemented the suggested BMPs than they will be to presentations made at a larger forum. The Guest River Group has provided funding and technical assistance for three BMPs.

Resource Extraction

Projects involving reclamation of abandoned mine lands are managed by the DMME. The following table outlines the resources necessary to undertake the projects outlined in Section 7.1 under resource extraction. It is anticipated ¾ FTE will be dedicated to technical assistance on design and installation of corrective actions. These activities normally fall within the duties of DMME and DMLR reclamation specialists and therefore are not an additional task for the agency.

Years	Resource Extraction Technical Assistance (Man years)	Resource Extraction Technical Assistance $	Total Cost
	DMME Full-time	DMME	
IY 1	0.75	80,000	60,000
IY 2	0.75	80,000	60,000
IY 3	0.75	80,000	60,000
IY 4	0.75	80,000	60,000
IY 5-IY 10	0.75	80,000	60,000
Totals	7.5		600,000

Additional Technical Assistance Resources

The Guest River Group has benefited from in-kind donations of technical assistance from federal, state and local agencies and organizations. The partners of the GRG are committed to continue this assistance throughout the Implementation Plan. Those FTE's are not catalogued here.

6.5 Estimating Costs and Benefits

The primary benefit of the implementation actions is achieving compliance with water quality standards for the Commonwealth of Virginia. The focus groups identified the major benefits of good water quality to include increased tourism due to improved recreational resources such as hunting, fishing, swimming and aesthetics. The quality of life improves as health benefits are realized with reduction of bacteria violations in the stream. Awareness of improving water quality results in peace of mind to the landowners. Some of the corrective actions will not only benefit water quality but will instill a sense of community pride.

According to the IPSI inventory, there are 82,000 feet of eroding streambank on perennial streams and 79,000 feet of eroding streambank on intermittent streams, which need stabilization measures. With an average cost of $20 per linear foot, the cost of this stabilization is in Table 6.5.

Since 1999, the Guest River Group has installed 65 sewage disposal systems with help from grant funding. Therefore to arrive at an average cost for sewage disposal systems, we used the data from these projects as a sample of the watershed. Assuming the ratio of alternative treatment units to traditional septic systems is the same for the watershed, we calculated an average cost of $3,659.97.

Table 6.6 Cost analysis of implementation actions

Control Measure	Unit	Estimated Units Needed	Average Cost/ Unit	Total Estimated Cost
Streambank Stabilization				
Perennial Streams	Feet	82,242	$20	$1,644,840
Intermittent	Feet	78,726	$20	$1,574,520
Urban				
Septic System Installation	systems	164	$3,660	$600,240
Road Bank Erosion	feet	528,000	$20	$10,560,000
Stormwater Retrofits	sq mi	12	$640,000	$7,680,000
Agriculture				
Disturbed Areas	Acres	30.5	$1,757	$53,589
Grazing Land Protection	Acres	3221.3	$870	$2,802,531
Pasture and Hayland Planting	Acres	713.6	$155	$110,608
Livestock Exclusion Fencing	feet		$2	
Resource Extraction				
Mined Land Reclamation	Acres	5068.4	$3,000	$15,205,200
Total				$40,231,528

7.0 Measurable Goals and Milestones

7.1 Milestones

The goal of the IP milestones is to measure progress over the implementation process. Stage 1 of each milestone list corresponds with the stage 1 implementation TMDL scenario from the TMDL scenarios. Stage 2 corresponds with the full TMDL scenario, as outlined in the TMDL studies. Stage 1 has two divisions, a commencing phase for project identification from the IPSI and beginning of performance, and a concerted implementation phase for reaching stage 1 implementation scenario reductions.

Urban Implementation Milestones:
STAGE 1:
Phase 1:
IY 1

- ✓ Conduct hotspot inventory for impervious surfaces and critically eroding stream reaches associated with stormwater problems. Focus on watersheds identified in IPSI. (Will need to hire person)
- ✓ Conduct inventory of critically eroding areas
- ✓ Conduct analysis of suspect straight pipe sites. Identify sites for installation of conventional septic systems. (Will need to hire person)
- ✓ Begin education and outreach efforts with contractors and local governments – focus of Low impact development workshops and review of ordinances
- ✓ Begin education and outreach program for local residents. Install demonstration projects such as rain gardens and rain barrels. Also focus on pet waste control for bacteria reduction

IY 2-3

- ✓ Develop plans and begin implementation of stormwater retrofits for hotspots identified in the stormwater management inventory
- ✓ Begin implementing erosion control project identified in critically eroding area inventory
- ✓ Work with local governments to change ordinances associated with erosion and stormwater control (if needed)
- ✓ Review results from PDC study on wastewater disposal solutions for hard to serve communities. Integrate findings into this IP
- ✓ Install 30 septic systems at sites identified through analysis

Phase 2:
IY 4-5

- ✓ 10% reduction of urban sources
- ✓ 25% urban disturbed areas
- ✓ 20% reduction of road bank erosion
- ✓ 1/3 of urban streambanks repaired
- ✓ 50% reduction of bacteria from Sepulcher Creek; 70% reduction in Toms Creek; 65% reduction in Crab Orchard Branch

STAGE 2:
Phase 3:
IY 10

- ✓ All Water Quality Goals Met
- ✓ Reduce residential urban sources by 60%, all other urban sources by 50%; urban disturbed areas by 70%
- ✓ Repair 50% of eroding road banks
- ✓ Repair ½ of eroding stream banks
- ✓ 71% reduction of bacteria from Sepulcher Creek, 84% reduction in Toms Creek; 94% reduction in Crab Orchard Branch

Agricultural Implementation Milestones:
STAGE 1:
Phase 1
IY 1

- ✓ Identify owners/operators for 100% (77 beef and 20 horse) livestock production
- ✓ Complete conservation plans (and offer cost-share assistance) to all livestock adjacent sites (32 beef and 2 horse) and Ag related streambank erosion sites
- ✓ Complete conservation planning for 100% of "overgrazed pasture"

IY 2

- ✓ Complete conservation planning for remaining (45 beef and 18 horse) livestock production site which includes 100% fair pasture. Begin application of all funded BMP's

IY 3

- ✓ Complete conservation application on all contracts approved for funding including grazing land protection and ag related streambank stabilization

Phase 2
IY 5

- ✓ 50% of overgrazed pastureland and hayland planting complete
- ✓ 50% of pastureland treated with practices applied
- ✓ 1/3 of all ag-related eroding streambanks stabilized
- ✓ 25% of all ag-related disturbed areas revegetated
- ✓ 75% of livestock adjacent sites with stream exclusion within Sepulcher Creek, Toms Creek and Crab Orchard Branch

STAGE 2:
Phase 3
IY 10

- ✓ All Water Quality Goals Met
- ✓ 100% of overgrazed pastureland treated with practices applied
- ✓ 100% of overgrazed pastureland and hayland planting
- ✓ 75% of fair pastureland treated with practices applied
- ✓ 50% of all ag-related eroding streambanks stabilized
- ✓ 70% of all disturbed areas revegetated

Resource Extraction Milestones:
STAGE 1:
Phase 1:
IY 1

- ✓ Cross reference IPSI identified previously mined land with existing mining permits and existing coal seams to identify remining opportunities within inventory
- ✓ Begin voluntary installation of BMPs at tipples identified in Sepulcher Creek
- ✓ Begin reclamation of abandoned mine lands identified in watershed

Table 7.1: Priority Tipples and AML features for Guest River IP

	Type	Description	Size
1	Tipple	Sepulcher Creek Tipple Site	3 acres
2	Tipple	Cheyenne Processing Tipple	4 acres
3	Tipple	H & G Enterprises	5 acres
4	Tipple	Gott Enterprises	3 acres
5	Tipple	Tacoma Fuels	2 acres
6	AML Feature	Hall Branch Outslopes	10 acres
7	AML Feature	Lipps Surface Mine	5 acres
8	AML Feature	Monkey Hill Outslopes	6 acres
9	AML Feature	Divide Ridge 2	10 acres
10	AML Feature	Esserville Surface Mine	4 acres
11	AML Feature	Cloverleaf Gob Pile	2 acres
12	AML Feature	Redman Gob Pile	8 acres

Phase 2:
IY 5

- ✓ Repair all abandoned mine features
- ✓ Full cover on 50% of previously mined lands
- ✓ 75% reduction of sediment delivery from tipples in Sepulcher Creek

STAGE 2:
Phase 3:
IY 10

- ✓ All Water Quality Goals Met
- ✓ Repair all abandoned mine features
- ✓ Full cover on 100% of previously mined land
- ✓ 90% reduction of sediment delivery from tipples in Sepulcher Creek

Forestry Implementation Milestones:

The reductions called for by the TMDL for forestry concerns was not a part of the stage 1 implementation scenario. However, the actions called for by this plan require minimal funding and intend to increase awareness of the issues in the watershed. Therefore, the forestry actions will be implemented throughout the ten-year implementation timeframe. The workshops for loggers will continue as it has for the past three years. The outreach

campaign for landowners will begin pending approval of funding proposals outlined in Chapter 10.

IY 1-10

- ✓ BMP training for logging contractors
- ✓ Develop training program for landowners to increase awareness if VDOF notification procedures
- ✓ Coordinate citizen watchdog group to monitor new logging jobs without proper VDOF notification

7.2 Reasonable Assurance

Since 1996, the Guest River Restoration Project has completed mine land reclamation, septic system installation, streambank stabilization, agricultural best management practices and education activities. The group will use the IP as a strategic plan to continue their efforts.

The completion of the regional sewer study by the PDC will bring solutions for the wastewater disposal issues the Guest River watershed faces. The study will also include plans for implementation of suggested measures, to include plans for funding of projects.

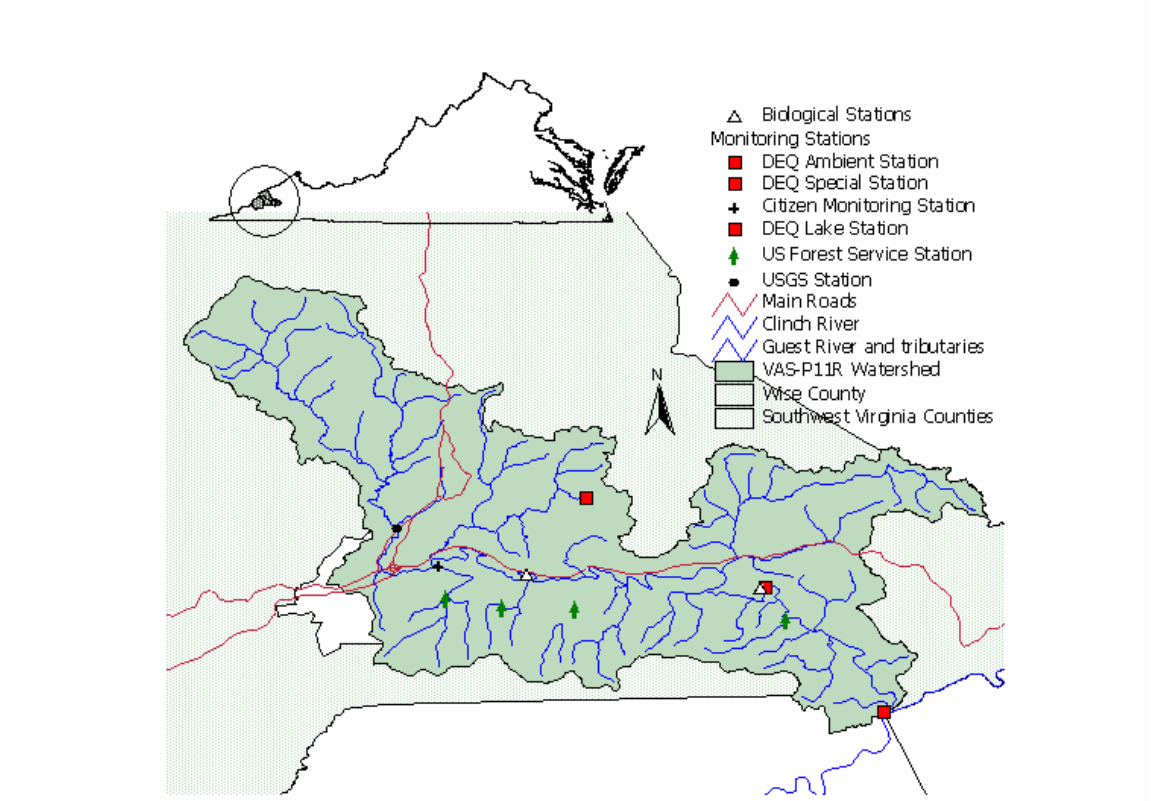
7.3 Tracking and Monitoring Plans

TVA, in partnership with the Guest River Group, plans to track the projects completed in the IPSI model, to calculate the reductions achieved. To ensure the model track progress properly, water quality monitoring will need to occur.

Sediment

DEQ will continue to monitor at the biological monitoring station, 6BGUE006.50 located at the Route 72 bridge in Coeburn on Guest River. Figure 7.1 shows the location of the DEQ Guest River station. The Total Maximum Daily Load Report for Aquatic Life Use calls for additional biological monitoring after at least 60% of the Best Management Practices are in place. If improvements are apparent, then follow up monitoring will take place in the fall. If there is no improvement in the community, then sampling will be held off until 90% of the BMPs are installed. Additionally, citizen monitoring efforts will be encouraged to see how corrective actions benefit the aquatic community.

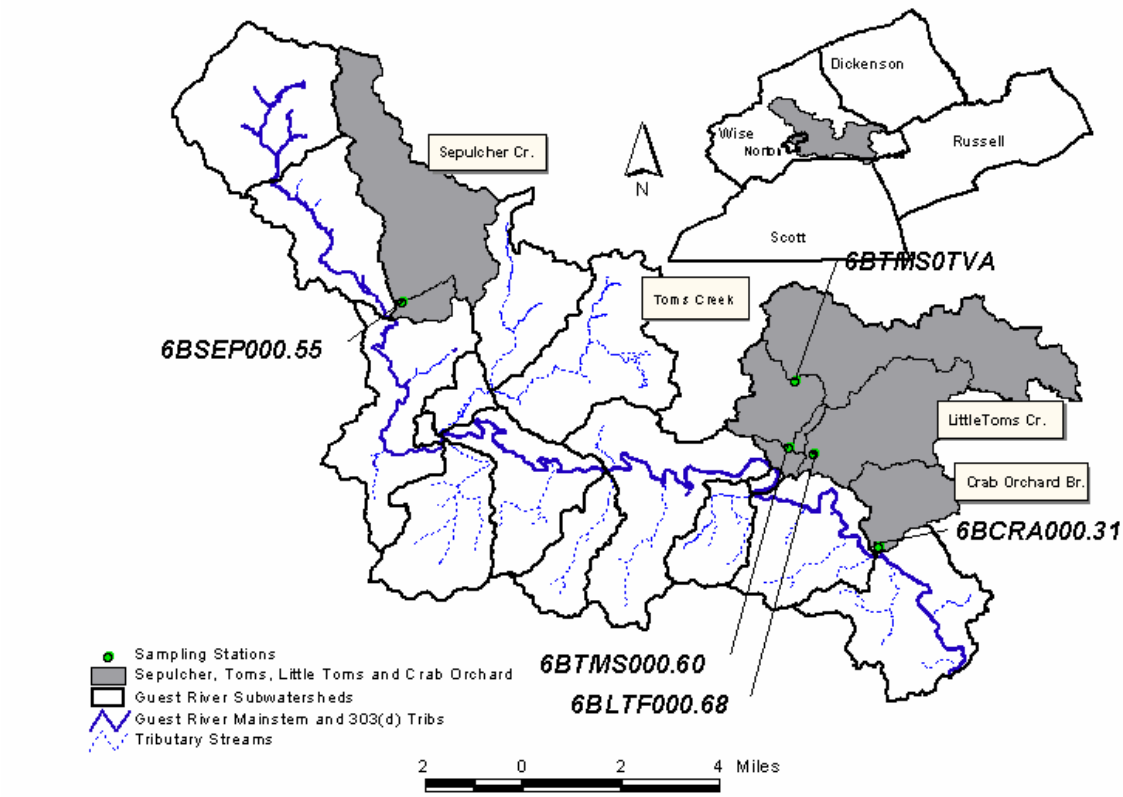
Figure 7.1 Biological Monitoring Station Locations



Bacteria

DEQ will continue to monitor Sepulcher Creek, Toms Creek and Crab Orchard Branch in accordance with its ambient monitoring program. These ambient water quality monitoring station include 6BSEP000.55, 6BTMS000.60, and 6BCRA000.31. Refer to Figure 7.2 for locations of the monitoring stations. DEQ and DCR will use data from the monitoring stations on Sepulcher Creek, Toms Creek and Crab Orchard Branch to evaluate reductions in bacteria counts and the effectiveness of the TMDL in attainment of water quality standards. Ambient sampling includes field parameters (temperature, pH, dissolved oxygen, conductivity), bacteria, nutrients and solids. Future bacteria sampling will consist of *E. coli* sampling only, since the interim fecal coliform bacteria criteria no longer applies after twelve *E. coli* samples have been collected. Additionally citizen monitoring efforts within the watersheds may be incorporated if this monitoring meets DEQ Quality Assurance Project Plan requirements.

Figure 7.2 Ambient Water Quality Monitoring Stations



7.4 Evaluation

Ultimate success will be determined when compliance with the water quality standards has been achieved. Each corrective action described in Chapter 6 was designed to reduce the load of bacteria or sediment from reaching the stream. The progress towards completing each of these actions should be reported to DEQ.

8.0 Stakeholders Roles and Responsibilities

8.1 Introduction

This chapter will identify the stakeholders and define their roles in the implementation of the TMDL. Stakeholders are individuals who live or have land management responsibilities in the watershed, including government agencies, businesses, private individuals and special interest groups. Stakeholder involvement and cooperation is essential for achieving the goals of these TMDLs (*i.e.* improving water quality and removing the Guest River from the impaired waters list). The roles and responsibilities of some of the major stakeholders are described below.

8.2 Federal Government

The United States Environmental Protection Agency (USEPA) has the responsibility of overseeing the various programs necessary for the success of the Clean Water Act. Administration and enforcement of such programs normally falls largely to the states.

8.3 State Government

In the Commonwealth of Virginia, water quality problems are addressed through legislation, incentive programs, education, and legal actions. Currently, there are a number of state agencies responsible for regulating and/or overseeing activities that impact water quality in Virginia. These agencies include: Virginia Department of Environmental Quality (DEQ), Virginia Department of Conservation and Recreation (DCR), Virginia Department of Agriculture and Consumer Services (VDACS), Virginia Department of Health (VDH), the Virginia Department of Forestry (VDOF), Virginia Corporative Extension (VCE), and Virginia Department of Mines, Minerals and Energy (DMME). The primary agencies applicable to the Guest River watershed are DEQ, DCR, VDH, VDOF, VCE and DMME.

DEQ: The State Water Control Law authorizes the State Water Control Board to control and plan for the reduction of pollutants impacting the chemical and biological quality of the State's waters resulting in the degradation of the swimming, fishing, shell fishing, aquatic life, and drinking water uses. For many years the focus of DEQ's pollution reduction efforts was the treated effluent discharged into Virginia's waters via the VPDES permit process. The TMDL process has expanded the focus of DEQ's pollution reduction efforts from the effluent of wastewater treatment plants to the pollutants causing impairments of the streams, lakes, and estuaries. The reduction tools are being expanded beyond the permit process to include a variety of voluntary strategies and BMPs. DEQ is the lead agency in the TMDL process. The Code of Virginia directs DEQ to develop a list of impaired waters, develop TMDLs for these waters, and develop IPs for the TMDLs. DEQ administers the TMDL process, including the public

participation component, and formally submits the TMDLs to USEPA and the State Water Control Board for approval. DEQ is also responsible for implementing point source allocations, assessing water quality across the state, and conducting water quality standard related actions. The Southwest Regional Office has personnel to monitor, assess and evaluate efforts in the Guest River Watershed. Educational outreach materials are also available from DEQ.

DCR: DCR is authorized to administer Virginia's nonpoint source pollution reduction programs in accordance with §10.1-104.1 of the Code of Virginia and §319 of the Clean Water Act. USEPA is requiring that much of the §319 grant monies be used for the development of TMDLs. Because of the magnitude of the NPS component in the TMDL process, DCR is a major participant in the TMDL process. DCR has a lead role in the development of IPs to address correction of nonpoint source pollution contributing to water quality impairments. DCR also provides available funding and technical support for the implementation of NPS components of IPs. The staff resources in DCR's TMDL program focus primarily on providing technical assistance and funding to stakeholders to develop and carry out IPs, and support to DEQ in
TMDL development related to NPS impacts. DCR staff also work with other state agencies, Soil and Water Conservation Districts, and watershed groups to gather support and to improve the implementation of TMDL plans through utilization of existing authorities and resources. The Upper Tennessee and Big Sandy Watershed office has recently hired a full-time TMDL /watershed field coordinator to support implementation efforts.

VDH: VDH is responsible for maintaining safe drinking water measured by standards set by the USEPA. Their duties also include septic system regulation and regulation of the land application of biosolids. VDH is complaint driven; complaints can range from a vent pipe odor that is not an actual sewage violation and takes very little time to investigate, to a large discharge violation that may take many weeks or longer to effect compliance. For TMDLs, VDH has the responsibility of enforcing actions to correct failed septic systems and/or eliminate straight pipes (Sewage Handling and Disposal Regulations, 12 VAC 5-610-10 *et seq*.). VDH works through the Wise County Health Department to correct sewage problems in Guest River watershed.

VDOF: VDOF responsibilities, as pertains to the TMDL implementation include assistance to non-industrial private forest landowners through professional forestry advice and technical management programs. Their duties include supervision of silvicultural best management practices, including reforestation, prevention of erosion and sedimentation, and maintenance of buffers for water quality, (Forest Resources and the Department of Forestry, Article 12 (§ 10.1-1181.1 *et seq*.). In addition, the law continues to establish that the State Forester shall cooperate with counties, municipalities, corporations and individuals in preparing plans and providing technical assistance, based on generally accepted scientific forestry principles, for the protection, management and replacement of trees, wood lots and timber tracts and the establishment and preservation of urban forests. Local VDOF staff is committed to additional efforts in education and outreach in the watershed.

VCE: VCE responds to the needs of individuals, families, groups and organizations with educational programs in the four broad areas of agriculture and natural resources, family and community sciences, food, nutrition, and health, and 4-H youth development. Agriculture and Natural Resources programs help sustain profitability of agricultural and forestry production, while protecting and enhancing the quality of our land and water resources. VCE staff through the Powell River Project provides best management practice training for lumber harvesting.

DMME: DMME provides state government, the business community, and citizens with a focal point for the development of innovative policies, and for the implementation of comprehensive programs for energy and mineral resources consistent with modern safety and conservation practices. The Department's Division of Mined Land Reclamation (DMLR) is responsible for ensuring the reclamation of land affected by surface and underground coal mining activity. Major functions include regulating surface effects of coal mining, reclaiming abandoned mine lands, issuing permits, performing inspections, assisting small operators, and responding to citizen concerns. Through permitting, mine inspections, operator assistance, and training activities, the DMLR promotes an environmentally sound mining industry throughout Virginia's coalfield counties of Buchanan, Wise, Dickenson, Tazewell, Russell, Lee, and Scott. In 1977, Congress enacted the Federal Surface Control and Reclamation Act (Public Law 95-87). The federal coal surface mining law established extensive new requirements that impacted the industry, coal mining states, and their regulatory agencies nationwide. Using a provision of the Act, which enables coal-mining states to establish their own regulatory programs, Virginia passed its own law (Virginia Coal Surface Mining Control Reclamation Act, Chapter 19, Title 45.1 of the Code) in 1979, which provided for the adoption of regulations comparable with Public Law 95-87. DMME staff will provide plans and specifications for AML reclamation as they have in the past for GRG projects.

8.4 Local Government

Local government includes four entities. The Guest River watershed blankets portions of four localities: the County of Wise, the City of Norton and the towns of Coeburn and Wise. Each jurisdictional government is divided into several departments and divisions. Each entity provides various service operations or resources that will be instrumental to the success of this IP. Wise County Building and Zoning Office will provide office space for an erosion and sediment control specialist to address the sediment issues in the watershed. The Wise County Health Department will provide support for the VISTA Volunteer.

9.0 Watershed Planning Efforts in the Guest River

9.1 Watershed Plans and Related Plans

In developing this IP, the TAC identified other plans that may overlap the actions listed within, in order to reduce the duplication of efforts. One plan is concurrently being developed with this IP, to address wastewater disposal solutions for Southwest Virginia. Lenowisco Planning District Commission has begun a comprehensive study of the current sewer service in the area and seeks new solutions to the difficulties the watersheds in the area present. Once completed, the study and plan will include: recommendations and cost estimates for addressing small communities with no public sewer or with failing septic systems. The following is a detailed extraction from the request for qualifications document from Lenowisco PDC outlining the purpose of the study:

I. Examine Service Areas
   a. Look at both existing and proposed service areas.
   b. Define service areas by topographical boundaries (drainage sheds).
   c. Determine locations of growth areas/growth corridors.
   d. Identify problem areas (i.e. failing/lacking septic systems).

I. Data Collection/Data Survey
   a. Meet with representatives from regulatory agencies including the Department of Environmental Quality, the Virginia Department of Health and local sanitarians.
   b. Meet with representatives of the localities and Public Service Authorities that operate sewage collection and treatment systems.
   c. Review existing sewer studies, 604(b) plans, master plans and comprehensive plans.
   d. Assess capacities of existing wastewater treatment facilities.

I. Identify Deficiencies
   a. Sanitary sewer overflows.
   b. Inflow/Infiltration problems.
   c. Wastewater treatment plants nearing threshold (95%) capacity.
   d. Public health problems due to failed septic fields or sanitary sewer overflows.

I. Identify “Hard to Serve” Communities
   a. Isolated communities.
   b. Areas currently discharging directly to receiving streams without treatment.
   c. Areas where conventional systems are not practical.
   d. Areas where construction will be exceptionally difficult due to steep terrain and presence of rock.

I. Identify Innovative Solutions for "Hard to Serve" Communities
   a. Recirculating sand filters.
   b. Low pressure systems.
   c. Grey water systems.
   d. Community septic tank management programs.

I. Examine Characteristics of Receiving Streams
   a. Quality and classifications of streams.
   b. Waste load allocations for each.
   c. Mass discharge limits.
   d. Unique watersheds/streams with great/unique recreational opportunities.

I. Wastewater Treatment Facilities
   a. Comprehensive look at existing plants.
   b. Note operational history/success of each plant.
   c. Identify plants that need upgrades and expansion.

I. Implementation Plans
   a. Develop in conjunction with the Planning District Commissions.
   b. Create matrix to identify priorities.
   c. Identify alternatives for project implementation including existing PSA's, Towns, Cities, regional authorities, cooperatives, watershed associations, privatization, etc.
   d. Develop regional service areas to enhance funding potential.
   e. Develop a phased approach to implementation.

I. Schematic Layouts and Mapping
   a. Identify and develop schematic layouts for potential collection system improvements including trunk (interceptor) lines, collectors, and rehabilitated existing sewer lines.
   b. Identify existing collection systems and treatment plants.
   c. Show proposed plants, service areas, and plants to be upgraded.

I. Cost Estimates
   a. Create comprehensive cost estimates that account for construction costs, lifecycle costs, debt service, and operation & maintenance costs.
   b. Account for inflation so that costs are relevant for the future.
   c. Examine rate structures and effects of proposed work on the same.
   d. Identify grant and low interest loan requirements for the maintenance of reasonable use rate structures.

I. Funding Alternatives
   a. Explore various funding alternatives available to establish necessary infrastructure to create a healthy and economically rewarding future for Southwest Virginia.
   b. Determine if possibly some existing programs can be redirected to better match up with regional needs and deficiencies.

9.2 Other Neighboring Impaired Waterbodies

The Guest River has also been listed for Polychlorinated Biphenyl (PCB) levels in fish tissue. TMDL development has not yet been scheduled for that segment.

10.0 Potential Funding Sources

10.1 Descriptions of Potential Funding Sources

In general, funding for the actions contained in this Implementation Plan (IP) could potentially come from three sources:
· Private / nonprofit funds
· Virginia State funds
· Federal funds
When shaping the approach for this IP consensus within the Technical Advisory Committee (TAC) centered on leveraging existing programs and resources to tackle implementation of these TMDL reductions. To that end, the approach developed by this IP is one that aims to build synergies with other programs in the watershed including state, federal, private landowners and businesses, private foundations and non-profit organizations. These are identified and discussed in the following sections.

10.1.1 Virginia State Funds

The State of Virginia has a vested interest in the success of this plan. The Virginia Department of Environmental Quality (DEQ) underwrote the cost of developing the Guest River TMDLs and this IP.

Virginia Revolving Loan Program - Loans may be made from the Fund, in the Board's discretion, to a local government or a holder as defined in §10.1-1009 for acquiring fee simple title or a permanent conservation or open space easement in real property upon the local government or holder establishing to the satisfaction of the Board that the acquisition will (i) protect or improve water quality and prevent the pollution of state waters, and (ii) protect the natural or open-space values of the property or assure its availability for agricultural, forestal, recreational, or open-space use. The Board shall consult with the Department of Conservation and Recreation in making a determination on whether the acquisition will meet the above requirements. Loans for land acquisition may be made only in fiscal years in which all loan requests from local governments for eligible projects as defined in §62.1-224 have first been satisfied. The Board shall develop guidelines for the administration of such loans.

Virginia Water Quality Improvement Fund - The purpose of the Virginia Water Quality Improvement Act of 1997 (WQIA) is to restore and improve the quality of state waters and to protect them from impairment and destruction for the benefit of current and future citizens of the Commonwealth of Virginia (Section 10.1-2118 of the Code of Virginia). Because this is a shared responsibility among state and local governments and individuals, the Water Quality Improvement Fund (WQIF) was created. The purpose of the fund is to provide water quality improvement grants to local governments, soil and water conservation districts and individuals for point and nonpoint source pollution prevention, reduction and control programs (Section 10.1-2128.B. of the Code of Virginia).

10.1.2 Federal Funds

USEPA 319 Funds – USEPA develops guidelines that describe the process and criteria to be used to award Clean Water Act Section 319 NPS grants to states. States may use up to 20% of the Section 319 incremental funds to develop NPS TMDLs as well as to develop watershed-based plans for Section 303(d) listed waters. The balance of funding can be used for implementing watershed-based plans for waters that have completed TMDLs. Implementation of both agricultural and residential BMPs is eligible. http://www.epa.gov/owow/nps/319/319stateguide-revised.pdf.

USEPA Brownfields Program - EPA's Brownfield program helps communities clean up and redevelop properties. EPA defines a Brownfield site as "real property, the expansion, redevelopment, or reuse of which may be contaminated by the presence or potential presence of a hazardous substance, pollutant, or contaminant." The program helps mitigate potential health risks and assists in restoring economic vitality to areas where brownfields exist. http://www.epa.gov/brownfields

USDA EQIP - The USDA Natural Resources Conservation Service's Environmental Quality Incentives Program (EQIP) was established to provide a voluntary conservation program for farmers and ranchers to address significant natural resource needs and objectives. Nationally, it provides technical, financial, and educational assistance; sixty percent of it is targeted to livestock-related natural resource concerns and the rest to more general conservation priorities. EQIP is available primarily in nationwide where there are significant natural resource concerns and objectives.

USDA CREP - The Conservation Reserve Enhancement Program (CREP) is a voluntary land retirement program that helps agricultural producers protect environmentally sensitive land, decrease erosion, restore wildlife habitat, and safeguard ground and surface water. Wise County landowners will be eligible for this program upon approval of the Implementation Plan.

US Fish and Wildlife Service Landowner Incentive Program - The U.S. Fish and Wildlife Service's Landowner Incentive Program (LIP) grant program provides competitive matching grants to states, territories, and the District of Columbia to establish or supplement landowner incentive programs. These programs provide technical and financial assistance to private landowners for projects that protect and restore habitats of listed species or species determined to be at-risk. LIP projects will likely involve activities such as the restoration of marginal farmlands to wetlands, the removal of exotic plants to restore natural prairies, a change in grazing practices and fencing to enhance important riparian habitats, instream structural improvements to benefit aquatic species, road closures to protect habitats and reduce harassment of wildlife, and acquisition of conservation easements. Although not directly eligible for these grants, third parties such as nonprofit organizations may benefit from these funds by working directly with their states to see if either grants or partnering opportunities are available.

The AML Fund - The AML Fund has had a major impact in most coal mining states. Many of the worst Priority 1 and 2 AML problems have been addressed. However, it is clear that the AML Fund cannot be seen as a mechanism that is capable of fully addressing the AML liabilities that remain.
First of all, the amount of money likely to be released from the fund is insufficient to reclaim AML in the near term, especially in those states that were major coal producers

prior to SMCRA. For example, in Virginia, an estimated $432 million in Priority 1, 2, and 3 AML liabilities remain (while annual funding in recent years has been on the order of $5 million (Table10.1). This situation is aggravated by the fact that Congress typically does not fully allocate AML Fund revenues to AML reclamation. The result is a substantial "unallocated balance" maintained as a book-entry by the U.S. Treasury.

Table 10.1: Comparison of AML Fund contributions and allocations in several major states.

State	AML taxes paid FY 96 $Millions	AML fund allocations FY 97 $Millions	Allocations as % of funds paid
Kentucky	3.5	16.2	48
Ohio	6.3	8.5	135
Pennsylvania	12.6	22.6	179
Virginia	7.1	4.8	68
West Virginia	34.7	22.5	65
Illinois	7.9	9.1	116
Indiana	10.4	5.2	50
Montana	11.6	3.7	32
Utah	4.0	1.5	37
Wyoming	90.4	22.0	24
U.S. Total	250.8	141.7	56

Source: U.S. Office of Surface Mining

In the major mining states, little work has been done to identify priority 3 areas, or the environmental impacts of AML. Virginia's AML inventory of priority 3 problems has advanced substantially in recent years, yet Virginia's AML officials acknowledge that this inventory is far from complete (Tables10.1 and 10.2.

Table 10.2: AML Inventory totals of 4 major AML problem types in 5 eastern coal-mining states and the U.S., as of November 6, 1997.

State	Clogged Stream Lands (acres)	Dangerous Highwalls (Ln ft)	Dangerous Piles or Embankments (Acres)	Dangerous slides (Acres)
Kentucky	7943	63688	1137	1548
Ohio	11738	57053	29	92
Pennsylvania	570	1106771	5294	7
Virginia	1739	92039	154	118
West Virginia	164	1371315	1964	337
5 state total	22154	2690866	8578	2102
% of U.S. total	93%	63%	52%	93%
U.S. total	23792	4272114	16587	2268

Source: Office of Surface Mining Reclamation and Enforcement, Division of Reclamation Support, Abandoned Mine Land Inventory System. Includes abandoned coal sites with priority 1 and 2 problems.

Table 10.3: Estimate of abandoned mined land acreage in Virginia's southwestern coalfields as of November 6, 1997.

Land	Acreage
Reclaimed by AML fund.	2562
Reclamation currently funded but not complete.	2720
Priority 1 and 2	7901
Priority 3	36,375
Total	49,558

Source: Virginia Division of Mined Land Reclamation.

The Guest River TMDL land use category table (Table 2.1) does identify 8,408.3 acres of previously mined lands – this would include priority 3 AML and AML features – within the Guest River watershed. The TMDL does attribute a TSS load of 7,125.6 tons per year to the Guest River from this land use category.

Secondly, the AML fund's status beyond the year 2004, when the authorizing legislation expires, remains uncertain. With the passage of time since 1977, remaining AML is becoming more concentrated in those states that were major coal producers prior to 1977. In many coal-mining states, AML Fund expenditures are typically far less than AML taxes paid by that state's coal industry (Table 10.1). In some of the major western coal-mining states, AML reclamation obligations are close to completion. A majority vote by both Houses of Congress will be required to extend AML Fund authorization beyond 2004, but it is not clear that the necessary consensus will be present.

A viable alternative to using AML program funds for the reclamation of previously mined lands through-out Virginia, including the Guest River watershed, is remining.

10.1.3 Landowner Contributions and Matching Funds

The cost share programs provided by Guest River funding has been greatly appreciated by the landowners in the watershed. For most projects, the group provided 75% cost share monies for septic installations, agricultural best management practices and other projects. Wise County has experienced a great deal of economic distress as the coal industry has moved out of the region. The number of families living below the poverty level in this watershed (17%) is double the state average (7%)(Table 10.4). The median household income for this area is $25,025, which is 42 percent of the state average (Table 10.5). For this reason, the GRG has also helped landowners apply for supplemental grants to help cover the 25% landowner contribution for low-income families.

Table 10.4 Poverty: percentage below poverty level.

	Coeburn	State of Virginia
Families	17.0%	7.0%
Families w/ kids under 18	29.1%	10.2%
Families w/kids under 5	29.2%	12.3%
Female householder/no husband present	39.0%	23.0%
Female householder/no husband present w/ kids under 18	71.9%	29.8%
Female householder/no husband present w/kids under 5	81.0%	40.7%
Individuals	20.5%	9.6%
Individuals over 18	17.4%	8.7%
Individuals over 65	7.8%	9.5%
Related children under 18	29.9%	11.9%
Related children 5 to 17 years	30.1%	11.4%
Unrelated individuals over 15	30.3%	19.9%

Table 10.5 Median Incomes: Family income combines two or more person's earnings.

	Coeburn	State of Virginia
Median Household Income	$25,025	$59,822
Median Retirement Income	$14,344	$20,920
Median Family Income	$28,929	$54,169

Source: U. S. Census Bureau at *www.census.gov*; only relevant information was used.

The Guest River Group has been very successful using matching grants for its projects in the past. In kind services can be useful to bring a project to completion. For the AML reclamation work that the Guest River Group has completed, DMME has provided construction plans and specifications as an in kind match.

10.1.4 Private foundations, non-profit organizations, businesses

Several nonprofit organizations will participate in the actions committed to in this IP. Much of those labors will be met through staff and volunteer time. Those efforts include outreach efforts like classroom presentations, buffer restoration, educational material development and distribution, etc. Funding for the activities pursued by the nonprofits can come from their members, a supporting foundation, or grants. Listed below are funding sources identified for the implementation actions identified in this IP:

National Fish and Wildlife Foundation Southern Rivers Conservation - Through the Southern Rivers Conservation Initiative, The National Fish and Wildlife Foundation supports projects to restore and enhance riparian habitat in twelve southeastern states (AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA, WV). The initiative funds projects that fall into the following three categories: (1) Stream Restoration (Restore Our Southern Rivers), (2) Freshwater Mussel Conservation (projects that support the National Strategy

for Mussel Conservation), and (3) Southeastern Imperiled Fishes Management (projects that support the Southeastern Imperiled Fishes Management Plan). In addition, projects should demonstrate community-based approaches to environmental stewardship; benefit water quality; demonstrate partnerships with others; involve specific on-the-ground activities; demonstrate landscape- or ecosystem-level approaches that complement other existing or planned restoration efforts in the watershed; and have a landowner and/or public education component.

Tiffany and Co. Foundation Environmental Conservation Grants - The Tiffany Foundation supports organizations dedicated to the conservation of natural resources. Partnering with environmental groups that study how to protect natural resources around the globe will lead to a better understanding of how to conserve them. The Foundation also considers groups who concentrate on social responsibility in the area of urban growth and minimizing the negative environmental impacts of growth.

Kodak American Greenways Grants - Grants may be used for activities such as: mapping, ecological assessments, surveying, conferences, and design activities; developing brochures, interpretative displays, audio-visual productions or public opinion surveys; hiring consultants, incorporating land trusts, building a foot bridge, planning a bike path, or other creative projects. In general, grants can be used for all appropriate expenses needed to complete a greenway project including planning, technical assistance, legal and other costs. Grants may not be used for academic research, general institutional support, lobbying, or political activities.

Reference

Virginia Department of Conservation and Recreation and Virginia Department of Environmental Quality. 2003. *Guidance Manual for Total Maximum Daily Load Implementation Plans* (July 2003). Richmond, Virginia

Northern Virginia Planning District Commission. 1996. *Nonstructural Urban BMP Handbook* (December 1996). Annanale, Virginia.

U.S. Environmental Protection Agency. 1999a. *Draft Guidance for Water-Quality Based Decisions: The TMDL Process* (Second Edition). EPA-841-D-99-001. Office of Water, Washington, D.C.

U.S. Environmental Protection Agency. 2002. *Supplemental Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories in FY 2003*. Office of Wetlands, Oceans, and Watersheds. Washington, D.C.

USDA Natural Resources Conservation Service. 2003. *FY 2003 Average Cost List.* Retrieved March, 2003 from http://www.va.nrcs.usda.gov.

Virginia Department of Conservation and Recreation website: http://www.dcr.state.va.us.

Virginia Department of Environmental Quality website: http://www.deq.state.va.us.

The Center for Watershed Protection website: http://www.cwp.org.

Glossary

Alternative waste treatment system—Any system for treatment of residential wastewater for return to the environment, other than a standard onsite septic system.
Bacterial Source Tracking (BST) — A collection of scientific methods used to track sources of fecal contamination.
Benthic— Refers to material, especially sediment, at the bottom of an aquatic ecosystem. It can be used to describe the organisms that live on, or in, the bottom of a water body.
Best Management Practices (BMPs) — Methods, measures or practices determined to be reasonable and cost-effective means for a landowner to meet certain, generally nonpoint source, pollution control needs. BMPs include structural and nonstructural controls and operation and maintenance procedures.
Cost-share program — A program that allocates project funds to pay a percentage of the cost of constructing or implementing a best management practice. The remaining costs are paid by the producer(s).
Discharge — Flow of surface water in a stream or canal, or the outflow of groundwater from a flowing artesian well, ditch or spring. Can also apply to discharge of liquid effluent from a facility or to chemical emissions into the air through designated venting systems.
Effluent — Municipal sewage or industrial liquid waste (untreated, partially treated, or completely treated) that flows out of a treatment plant, septic system, pipe, *etc.*
Fecal coliform — Indicator organisms (organisms indicating presence of pathogens) associated with the digestive tract of warm-blooded animals.
Fixed-frequency water quality monitoring — Collecting water samples from a fixed location over time at regular intervals (*e.g.*, bi-monthly, monthly, annually.)
Full time equivalent (FTE) — FTE is calculated by dividing the total number of paid hours by the number of hours in a time period.
GIS (Geographic Information System) — Computer programs linking features commonly seen on maps (such as roads, town boundaries, water bodies) with related information not usually presented on maps, such as type of road surface, population, type of agriculture, type of vegetation, or water quality information. A GIS is a unique information system in which individual observations can be spatially referenced to each other.
Hardened crossing — A stabilized area (*e.g.*, concrete or wooden bridge) that provides access to and/or across a stream for livestock and/or farm machinery.
Hydrography — The variation of stage (depth) or discharge in a stream over a period of time.
IPSI (Integrates Pollutant Source Identification) — A computer simulation tool used to mathematically model nonpoint source pollution sources and movement of pollutants in a watershed.
Load allocation (LA) — The portion of a receiving water's loading capacity attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources. Load allocations are best estimates of the loading, which can range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading. Wherever possible, natural and nonpoint source loads should be distinguished.

Loading capacity (LC) — The greatest amount of loading a water body can receive without violating water quality standards.
Modeling – A system of mathematical expressions that describe the spatial and temporal distribution of water quality constituents resulting from fluid transport and the one or more individual processes and interactions within some prototype aquatic ecosystem.
Monitoring – Periodic or continuous surveillance to determine the pollutant levels in water bodies.
Nonpoint source — Pollution that originates from multiple sources over a relatively large area. Nonpoint sources can be divided into source activities related to either land or water use including failing septic tanks, improper animal-keeping practices, mining practices, forest practices, and urban and rural runoff.
Nutrient — Any substance assimilated by living things that promotes growth. The term is generally applied to nitrogen and phosphorus in wastewater, but is also applied to other essential and trace elements.
Pathogens – Microorganisms (*e.g.*, bacteria, viruses or parasites) that can cause disease in humans, animals, and plants.
Point source — Pollutant loads discharged at a specific location from pipes, outfalls, and conveyance channels from either municipal wastewater treatment plants or industrial treatment facilities or any conveyance such as a ditch, tunnel, conduit or pipe from which pollutants are discharged. Point sources have a single point of entry with a direct path to a water body. Point sources can also include pollutant loads contributed by tributaries to the main receiving water stream or river.
Riparian areas — Areas bordering streams, lakes, rivers and other watercourses. These areas have high water tables and support plants that require saturated soils during all or part of the year. Riparian areas include both wetland and upland zones.
Runoff — That part of precipitation, snowmelt, or irrigation water that runs off the land into streams or other surface water. It can carry pollutants from the air and land into receiving waters.
SL6 Grazing Land Protection Systems — A structural and/or management practice that will enhance or protect vegetative cover to reduce runoff of sediment and nutrients from existing pastureland, and reduce NPS pollution associated with grazing livestock.
Stakeholder — Any person with a vested interest in the TMDL development, *e.g.*, farmer, landowner, resident, business owner, or special interest group.
Storm-event water quality monitoring — Collecting water samples from a location during and/or immediately following a rainstorm.
Straight pipe — Delivers wastewater directly from a building (*e.g.*, house or milking parlor) to a stream, pond, lake or river.
TMDL (Total Maximum Daily Load) -- The sum of individual waste load allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources and natural background, plus a Margin of Safety (MOS). TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measures that relate to a state's water quality standard.
Waste load allocation (WLA) — The portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. WLAs constitute a type of water quality-based effluent limitation (40CFR 130.2(h)).
Watershed — A drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation.

Appendix A

Description of BMPs

Animal waste management: A planned system designed to manage liquid and solid waste from livestock and poultry. It improves water quality by storing and spreading waste at the proper time, rate and location.
Artificial wetland/rock reed microbial filter: A long shallow hydroponic plant/rock filter system that treats polluted waste and wastewater. It combines horizontal and vertical flow of water through the filter, which is filled with aquatic and semi-aquatic plants and microorganisms and provides a high surface area of support media, such as rocks or crushed stone.
Avoid adding materials containing trace metals: Limiting or eliminating application of fertilizers and pesticides containing trace metals.
Compost facility: Treating organic agricultural wastes in order to reduce the pollution potential to surface and ground water. The composting facility must be constructed, operated and maintained without polluting air and/or water resources.
Conservation landscaping: The placement of vegetation in and around stormwater management BMPs. Its purpose is to help stabilize disturbed areas, enhance the pollutant removal capabilities of a stormwater BMP, and improve the overall aesthetics of a stormwater BMP.
Conservation tillage: Any tillage and planting system that maintains at least 30% of the soil surface covered by residue after planting for the purpose of reducing soil erosion by water.
Contour farming: Tillage, planting, and other farming operations performed on or near the contour of the field slope. This results in reducing sheet and rill erosion and reducing transport of sediment and other water-borne contaminants. This practice applies on sloping land where crops are grown and is most effective on slopes between 2 and 10 percent.
Cover crops and rotations: Establishing grass and/or legume vegetation to reduce soil erosion and enhance water quality.
Critical area planting: Establishing permanent vegetation on sites that have or are expected to have high erosion rates, and on sites that have physical, chemical or biological conditions that prevent the establishment of vegetation with normal practices. This practice is used in areas with existing or expected high rates of erosion or degraded sites that usually cannot be stabilized by ordinary conservation treatment.
Crop rotations: Growing crops in a recurring sequence on the same field in order to: reduce sheet and rill erosion, reduce soil erosion from wind, maintain or improve soil organic matter content, manage the balance of plant nutrients, improve water use efficiency, manage saline seeps, manage plant pests, provide food for domestic livestock, and provide food and cover for wildlife.
Crop/plant variety selection: management strategy (part of Integrated Pest Management) used to control pests (i.e. weeds, insects, diseases) while minimizing pollution. Crop rotation is used to break pest life cycles. Volunteer plants serving as hosts for certain diseases and insects can be controlled by destroying the crop two to three weeks prior to planting new crops.

Detention pond/basin: Detention ponds maintain a permanent pool of water in addition to temporarily detaining stormwater. The permanent pool of water enhances the removal of many pollutants. These ponds fill with stormwater and release most of it over a period of a few days, slowly returning to its normal depth of water.
Diversions: Establishing a channel with a supporting ridge on the lower side constructed along the general land slope which improves water quality by directing nutrient and sediment laden water to sites where it can be used or disposed of safely.
Drip irrigation: An irrigation method that supplies a slow, even application of low-pressure water through polyethylene tubing running from supply line directly to a plant's base. Water soaks into the soil gradually, reducing runoff and evaporation (*i.e.*, salinity). Transmission of nutrients and pathogens spread by splashing water and wet foliage created by overhead sprinkler irrigation is greatly reduced. Weed growth is minimized, thereby reducing herbicide applications. Vegetable farming and virtually every type of landscape situation can benefit from the use of drip irrigation.
Earthen embankment: A raised impounding structure made from compacted soil. It is appropriate for use with infiltration, detention, extended-detention or retention facilities.
Fencing: A constructed barrier to livestock, wildlife or people. Standard or conventional (barbed or smooth wire), suspension, woven wire, or electric fences shall consist of acceptable fencing designs to control the animal(s) or people of concern and meet the intended life of the practice.
Field borders: The establishment of field borders adjacent to wildlife habitats that will soften field transitions to other land uses. These borders can be on any side of a field and are not restricted to lower field borders, as are filter strips.
Filtration (*e.g.*, sand filters): Intermittent sand filters capture, pretreat to remove sediments, store while awaiting treatment, and treat to remove pollutants (by percolation through sand media) the most polluted stormwater from a site. Intermittent sand filter BMPs may be constructed in underground vaults, in paved trenches within or at the perimeter of impervious surfaces, or in either earthen or concrete open basins.
Grade stabilization (*e.g.*, chemical stabilization): A temporary measure employed on bare soils until permanent vegetation is established or other long-term erosion-control measures are implemented. The use of organic chemicals and oil derivatives may not be possible due to suspected surface and ground water contamination by carcinogenic priority organic pollutants.
Grassed swale: A broad and shallow earthen channel vegetated with erosion resistant and flood-tolerant grasses. Check dams are strategically placed in the swale to encourage ponding behind them. The purpose of a grassed swale is to convey stormwater runoff at a non-erosive velocity in order to enhance its water quality through infiltration, sedimentation, and filtration.
Grassed waterway: A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation which conveys runoff from terraces, diversions, or other water concentrations without causing erosion or flooding and reduces gully erosion.
Green rooftops: A thin layer of vegetation that is installed on top of a conventional flat or slightly sloping roof. It can consist of a light weight vegetated system, or an elaborate rooftop landscape or garden. Internal drainage layers serve to moderate the rate of runoff while allowing for water and nutrient uptake by vegetated materials. Green rooftops can often be engineered to conform to existing load requirements of most roofs—therefore enabling the retrofit of existing buildings.

Infiltration Basin: A vegetated open impoundment where incoming stormwater runoff is stored until it gradually infiltrates into the soil strata. While flooding and channel erosion control may be achieved within an infiltration basin, they are primarily used for water quality enhancement.

Infiltration Trench: A shallow, excavated trench backfilled with a coarse stone aggregate to create an underground reservoir. Stormwater runoff diverted into the trench gradually infiltrates into the surrounding soils from the bottom and sides of the trench. The trench can be either an open surface trench or an underground facility.

Integrated pest management: A procedure to prevent excessive and/or unnecessary application of pesticides to land and/or crops for the control of pests. Improves water quality by scouting fields and/or crops and applying pesticides only when the pest reaches the threshold of economic damage.

Irrigation water management: The process of determining and controlling the volume, frequency, and application rate of irrigation water in a planned, efficient manner. An irrigation system adapted for site conditions (soil, slope, crop grown, climate, water quantity and quality, etc.) must be available and capable of applying water to meet the intended purpose(s).

Lagoon pump out: A waste treatment impoundment made by constructing an embankment and/or excavating a pit or dugout in order to biologically treat waste (such as manure and wastewater) and thereby reduce pollution potential by serving as a treatment component of a waste management system.

Land-use conversion: BMPs that involve a change in land use in order to retire land contributing detrimentally to the environment. Some examples of BMPs with associated land use changes are: Conservation Reserve Program (CRP) - cropland to pasture; Forest conservation - pervious urban to forest; Forest/grass buffers - cropland to forest/pasture; Tree planting - cropland/pasture to forest; and Conservation tillage – conventional tillage to conservation tillage.

Limit livestock access: Excluding livestock from areas where grazing or trampling will cause erosion of stream banks and lowering of water quality by livestock activity in or adjacent to the water. Limitation is generally accomplished by permanent or temporary fencing. In addition, installation of an alternative water source away from the stream has been shown to reduce livestock access.

Litter control: Litter includes larger items and particulates deposited on street surfaces, such as paper, vegetation residues, animal feces, bottles and broken glass, plastics and fallen leaves. Litter-control programs can reduce the amount of deposition of pollutants by as much as 50%, and may be an effective measure of controlling pollution by storm runoff.

Livestock water crossing facility: Providing a controlled crossing for livestock and/or farm machinery in order to prevent streambed erosion and reduce sediment.

Manufactured BMP systems: Structural measures which are specifically designed and sized by the manufacturer to intercept stormwater runoff and prevent the transfer of pollutants downstream. They are used solely for water quality enhancement in urban and ultra-urban areas where surface BMPs are not feasible.

Mulching/protective covers: Applying plant residues, by-products or other suitable materials produced off site, to the land surface. This practice conserves soil moisture, moderates soil temperature, provides erosion control, suppresses weed growth, establishes vegetative cover, improves soil condition, and increases soil fertility.

Nutrient management: Determining nutrient needs for cropland (with the exception of hay or pasture that receives mechanical applications of collected animal manure) and adjusting the application of nutrients accordingly.

Onsite treatment system installation: Conventional onsite wastewater treatment and disposal system (onsite system) consists of three major components: a septic tank, a distribution box, and a subsurface soil absorption field (consisting of individual trenches). This system relies on gravity to carry household waste to the septic tank, move effluent from the septic tank to the distribution box, and distribute effluent from the distribution box throughout the subsurface soil absorption field. All of these components are essential for a conventional onsite system to function in an acceptable manner.

Porous pavement: An alternative to conventional pavement, it is made from asphalt (in which fine filler fractions are missing) or modular or poured-in concrete pavements. Its use allows rainfall to percolate through it to the subbase, providing storage and enhancing soil infiltration that can be used to reduce runoff and combined sewer overflows. The water stored in the subbase then gradually infiltrates the subsoil.

Proper site selection for animal feeding facility: Establishing or relocating confined feeding facilities away from environmentally vulnerable areas such as sinkholes, streams, and rivers in order to reduce or eliminate the amount of pollutant runoff reaching these areas.

Rain garden: Rain gardens are landscaped gardens of trees, shrubs, and plants located in commercial or residential areas in order to treat stormwater runoff through temporary collection of the water before infiltration.

They are slightly depressed areas into which stormwater runoff is channeled by pipes, curb openings, or gravity.

Range and pasture management: Systems of practices to protect the vegetative cover on improved pasture and native rangelands. It includes practices such as seeding or reseeding, brush management (mechanical, chemical, physical, or biological), proper stocking rates and proper grazing use, and deferred rotational systems.

Re-mining: Surface mining of previously mined and abandoned surface and underground mines to obtain remaining coal reserves. Re-mining operations create jobs in the coal industry, produce coal from previously disturbed areas, and improve aesthetics by backfilling and re-vegetating areas according to current reclamation standards. Re-mining operations also reduce safety and environmental hazards (by sealing existing portals and removing abandoned facilities), enhance land use quality, and decrease pre-existing pollution discharges.

Retention basin: A stormwater facility that includes a permanent pool of water and, therefore, is normally wet even during non-rainfall periods. Inflows from stormwater runoff may be temporarily stored above this permanent pool.

Riparian Buffer Zone: A protection method used along streams to reduce erosion, sedimentation, and the pollution of water from agricultural nonpoint sources.

Roof downspout system: A structure that collects, controls, and transports precipitation from roofs. This practice may be applied as a part of a resource management system in order to improve water quality, reduce soil erosion, increase infiltration, protect structures, and increase water quantity.

Septic system pump-out: A typical septic system consists of a tank that receives waste from a residence or business, and a drain field or subsurface absorption system consisting of a series of percolation lines for the disposal of the liquid effluent. Solids (sludge) that remain after decomposition by bacteria in the tank must be pumped out periodically.

Sewer line maintenance/sewer flushing: Sewer flushing during dry weather is designed to periodically remove solids that have deposited on the bottom of the sewer and the biological slime that grows on the walls of combined sewers during periods of low-flow. Flushing is especially necessary in sewer systems that have low grades which has resulted in velocities during low-flow periods that fall below those needed for self-cleaning.
Silt Fencing: A temporary sediment barrier consisting of filter fabric buried at the bottom, stretched, and supported by posts, or straw bales staked into the ground, designed to retain sediment from small disturbed areas by reducing the velocity of sheet flows. Because silt fences and straw bales can cause temporary ponding, sufficient storage area and overflow outlets should be provided.
Spillway, emergency: A vegetated emergency spillway is an open channel, usually trapezoidal in cross-section, which is constructed beside an embankment. It consists of an inlet channel, a control section, and an exit channel, and is lined with erosion-resistant vegetation. Its purpose is to convey flows that are greater than the principal spillway's design discharge at a non-erosive velocity to an adequate channel.
Spillway, principal: The primary outlet device for a stormwater impoundment usually consisting of either a riser structure in combination with an outlet conduit (which extends through the embankment) or a weir control section cut through the embankment. The purpose of a principal spillway is to provide a primary outlet for storm flows, usually up to the 10- or 25-year frequency storm event. The principal spillway is designed and sized to regulate the allowable discharge from the impoundment facility.
Stream bank protection and stabilization: Stabilizing shoreline areas that are being eroded by landshaping, constructing bulkheads, riprap revetments, gabion systems, or establishing vegetation.
Street sweeping: The practice of passing over an impervious surface, usually a street or a parking lot, with a vacuum or a rotating brush for the purpose of collecting and disposing of accumulated debris, litter, sand, and sediments. In areas with defined wet and dry seasons, sweeping prior to the wet season is likely to be beneficial; following snowmelt and heavy leaf fall are also opportune times.
Strip cropping: Growing row crops, forages, small grains, or fallow in a systematic arrangement of equal width strips across a field that reduces soil erosion and protects growing crops from damage by wind-borne soil particles.
Terraces: An earth embankment, or a combination ridge and channel, constructed across the field slope.
Terraces can be used when there is a need to conserve water, excessive runoff is a problem, and the soils and topography are such that terraces can be constructed and farmed with reasonable effort.
Vegetated filter strip: A densely vegetated strip of land engineered to accept runoff from upstream development as overland sheet flow. It may adopt any naturally vegetated form, from grassy meadow to small forest. The purpose of a vegetated filter strip is to enhance the quality of stormwater runoff through filtration, sediment deposition, infiltration and absorption.
Waste system/storage (*e.g.*, lagoons, litter shed): Waste treatment lagoons biologically treat liquid waste to reduce the nutrient and BOD content. Lagoons must be emptied and their contents disposed of properly.
Water treatment: Physical, chemical and/or biological processes used to treat concentrated discharges. Physical-chemical processes that have been demonstrated to

effectively treat discharge include sedimentation, vortex separation, screening (*e.g.*, fine-mesh screening), and sand-peat filters. Chemical additives used to enhance separation of particles from liquid include chemical coagulants such as lime, alum, ferric chloride, and various polyelectrolytes. Biological processes that have been demonstrated to effectively treat discharges include contact stabilization, biodiscs, oxidation ponds, aerated lagoons, and facultative lagoons.

Wetland development/enhancement: The construction of a wetland for the treatment of animal waste runoff or stormwater runoff. Wetlands improve water quality by removing nutrients from animal waste or sediments and nutrients from stormwater runoff.

Appendix C
Support Documentation